DOCUMENT RESUME

ED 189 020 SO 012 719

| | |
|---|---|
| TITLE | The Person-Number Systems of Sweden, Norway, Denmark, and Israel. Vital and Health Statistics. Data Evaluation and Methods Research, Series 2, Number 84. |
| INSTITUTION | National Center for Health Statistics (DHEW/PHS), Hyattsville, Md. |
| REPORT NO | DHHS-PHS-80-1358 |
| PUB DATE | Jun 80 |
| NOTE | 67p. |
| AVAILABLE FROM | National Center for Health Statistics, 3700 East-West Highway, Hyattsville, MD 20782 (free) |
| EDRS PRICE | MF01/PC03 Plus Postage. |
| DESCRIPTORS | *Classification; Comparative Analysis; Government Role; *Health Services; Number Concepts; *Number Systems; Research Methodology; Research Reports; *Statistical Analysis; *Statistical Data; *Use Studies |
| IDENTIFIERS | Denmark; Israel; Norway; Person Numbering Systems; Sweden |

ABSTRACT

The booklet presents a report on the operation and use of person numbering (PN) systems for vital and health statistics in Israel and Scandinavia. A PN system involves assigning a different number to each individual within a given society and using that number for commercial, governmental, and military identification. The purpose of the report is to provide information about PN systems to people involved in the public policy debate over whether such a system should be adopted in the United States. The document is presented in eight chapters. Chapter I explains how to develop a PN system and relates that Israel and the Scandinavian nations were selected as case studies because they are forerunners in developing and applying PN systems in national statistical programs. Chapters II through V focus on the PN systems of Sweden, Norway, Denmark, and Israel, respectively. Topics include organizing and operating the systems, problems peculiar to each country, administrative and statistical uses of the PN system, future use plans, and plans for additional studies and research. Chapter VI reviews advantages and limitations of PN systems. Advantages include that PN systems are technically easy to use and store and that they increase data available for statistics, planning, and research. Disadvantages include that the digits become reversed fairly frequently, number files are not always transferred when a person moves, and integration with other systems is difficult. Chapter VII focuses on issues of confidentiality and privacy. The final chapter presents an overview of PN systems in 16 nations, including the Netherlands, Peru, Australia, and Japan. (DB)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY



ED189020

# The Person-Number Systems of Sweden, Norway, Denmark, and Israel

VITAL and HEALTH STATISTICS

DATA EVALUATION AND METHODS RESEARCH

Series 2-Number 84

SP 012 719

DHHS Publication No. (PHS) 80-1358

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Office of Health Research, Statistics, and Technology
National Center for Health Statistics
Hyattsville, Md. June 1980

JUL 2 9 1980

# NATIONAL CENTER FOR HEALTH STATISTICS

DOROTHY P. RICE, *Director*

ROBERT A. ISRAEL, *Deputy Director*
JACOB J. FELDMAN, Ph.D., *Associate Director for Analysis*
GAIL F. FISHER, Ph.D., *Associate Director for the Cooperative Health Statistics System*
ROBERT A. ISRAEL, *Acting Associate Director for Data Systems*
ALVAN O. ZARATE, Ph.D., *Acting Associate Director for International Statistics*
ROBERT C. HUBER, *Associate Director for Management*
MONROE G. SIRKEN, Ph.D., *Associate Director for Mathematical Statistics*
PETER L. HURLEY, *Associate Director for Operations*
JAMES M. ROBEY, Ph.D., *Associate Director for Program Development*
GEORGE A. SCHNACK, *Acting Associate Director for Research*
ALICE HAYWOOD, *Information Officer*

## OFFICE OF INTERNATIONAL STATISTICS

ALVAN O. ZARATE, Ph.D., *Acting Associate Director*

**Library of Congress Cataloging in Publication Data**

Lunde, Anders Steen
The person number system of Sweden, Norway, Denmark, and Israel.

(Vital and health statistics : Series 2, Data evaluation and methods research ; no. 84) ([DHHS publication] ; (PHS) 80-1358)
Supt. of Docs. no.: HE 20.6209:2/84
1. Scandinavia—Statistical services. 2. Identification numbers, Personal—Scandinavia. 3. Privacy, Right of—Scandinavia. 4. Israel—Statistical services. 5. Identification numbers, Personal—Israel. 6. Privacy, Right of—Israel. I. Title. II. Series: United States. National Center for Health Statistics. Vital and health statistics : Series 2, Data evaluation and methods research ; no. 84. III. Series: United States. Dept. of Health and Human Services DHHS publication ; (PHS) 80-1358.

| | | | | |
|---|---|---|---|---|
| RA409.U45 | no. 84 | [HA37.S2] | 312'.07'23s | 79-607800 |
| ISBN 0-8406-0179-4 | | | | [001.4'22] |

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

**Vital and Health Statistics-Series 2-No. 84**

**DHHS Publication No. (PHS) 80-1358**
*Library of Congress Catalog Card Number 79-607800*

# FOREWORD

For some years, the proposal to establish a person numbering system in the United States has been a matter of public policy debate.

The use of a number to uniquely identify an individual, and its application universally for commercial, governmental and military identification purposes has obvious advantages from a data processing, epidemiological and health research, and record linkage point of view; and personal advantages to the individual as well. Person numbering systems have existed in many parts of the world under a variety of systems of governments. However, many persons view the establishment of such a system as a real or potential threat to the traditional freedoms enjoyed by Americans.

At its May 1976 meeting, the United States National Committee on Vital and Health Statistics recommended that the National Center for Health Statistics prepare a report describing the operation and use of these systems.

This report describes the techniques used in these numbering systems. No attempt has been made to assess the health, social, or economic impact of these systems. The report is intended to be factual, and makes no recommendations either for or against the use of person numbering systems in the United States.

# ACKNOWLEDGMENTS

This report was made possible through the cooperation of officials of the central bureaus of statistics of Sweden, Norway, and Denmark, and the Director of the Ministry of the Interior of Israel. The associate authors who contributed manuscripts are:

Ms. Judith Huebner, Deputy Director General, Ministry of the Interior, Hakirya, Jerusalem, Israel

Ms. Gerd S. Lettenstrom, Chief, Population and Health Statistics, Central Bureau of Statistics, Oslo, Norway

Mr. Stig Lundeborg, Department for Statistics on Individuals, National Central Bureau of Statistics, Stockholm, Sweden

Mr. Lars Thygesen, Chief, Public Registers Section, Danmarks Statistik, Copenhagen, Denmark

Dr. Anders S. Lunde, Consultant to the National Center for Health Statistics, wrote the introduction and the last chapter, and edited the final report. The officials of the countries mentioned contributed to the final chapter.

# CONTENTS


Foreword ..... iii

Acknowledgments ..... iv

Chapter I. Development of the Person-Number System ..... 1
- Introduction ..... 1
- The Person Number and Its Use ..... 2
- Construction of the PN ..... 3
- Selection of the Countries ..... 4

Chapter II. The Personal Identification Number in Sweden ..... 5
- Introduction ..... 5
- Operation of the PN System ..... 5
- Integration in the Numbering System ..... 6
- Use of the PN ..... 6
  - Social Security Insurance System ..... 7
  - Health Services ..... 7
  - Vital Statistics ..... 7
  - Health Statistics ..... 8
- Technical and Other Problems ..... 9
  - Solving Problems ..... 10
- Future Anticipated Use of the PN System ..... 11

Chapter III. The Person-Number System in Norway ..... 12
- Introduction ..... 12
- Characteristics in the System ..... 12
- Organization of the Files ..... 13
- Operation of the System ..... 13
- Updating of the Central Population Register ..... 13
- Use of the Person Number ..... 14
  - Administrative Use ..... 14
  - Use in the National Insurance System ..... 14
  - Use in Vital and Health Statistics ..... 14
  - Use in Research ..... 15
  - Problems in the System ..... 16
  - Future Use ..... 16
  - Plans for Additional Studies and Research ..... 17

Chapter IV. Personal Identification Numbers and Population Statistics in Denmark ..... 18
- Introduction ..... 18
- Structure of the Central Population Register ..... 19
- General Application of the PN ..... 19
  - Population Statistics ..... 19
  - Other Applications ..... 20
- Future Plans Regarding the Utilization of Registers ..... 21

Chapter V. The Population Registry and the Use of Personal Identity Numbers in Israel ..... 23
- Introduction ..... 23
- A Note on the Israeli Use of a Number System ..... 24
- Development of the Existing PN ..... 24
- Use of the PN System ..... 24
  - Registration of Births ..... 25
  - Voters' Ledger ..... 25
  - Border Control Card File (Personal) ..... 25

Problems and Difficulties with the System ..... 26
Plans for the Future ..... 26

Chapter VI. Advantages and Limitations of the Person-Number System ..... 28
Sweden ..... 28
Norway ..... 29
Denmark ..... 29
Israel ..... 30

Chapter VII. Confidentiality and Privacy ..... 33
Sweden ..... 33
Norway ..... 35
Denmark ..... 36
Israel ..... 37

Chapter VIII. Other Person-Number Systems in the World Today ..... 39
Advanced Systems ..... 39
Finland ..... 39
France ..... 39
Iceland ..... 41
The Netherlands ..... 41
Developing Countries ..... 42
Argentina ..... 42
Chile ..... 42
Colombia ..... 43
Peru ..... 43
Uruguay ..... 43
Jordan ..... 44
Health, Social Security, and Insurance Systems ..... 44
United Kingdom ..... 44
Australia ..... 45
Other Countries ..... 45
Other National Systems ..... 45
Federal Republic of Germany ..... 45
Japan ..... 46
Portugal ..... 46
United States ..... 46

References ..... 48

Bibliography ..... 49

Appendixes
I. Construction of the PN in Sweden ..... 52
II. Construction of the PN in Norway ..... 53
III. Structure of the PN in Denmark ..... 54
IV. Construction of the PN in Israel ..... 55
V. Items in the Swedish Cancer-Environment Register ..... 56
VI. Items in Study "Outcome of Successive Pregnancies for Norwegian Women 1967-1979" ..... 57
VII. Population, Birth, and Death Data ..... 59

## LIST OF TEXT TABLES

A. Examples of Person Numbers: Sweden, Norway, Denmark, and Israel ..... 3

B. Characteristics maintained in the Central Population Register Situation File ..... 12

C. Items in Person Numbers in planned or operational national data systems ..... 40

## SYMBOLS

| | |
|---|---|
| Data not available | ... |
| Category not applicable | ... |
| Quantity zero | - |
| Quantity more than 0 but less than 0.05 | 0.0 |
| Figure does not meet standards of reliability or precision | * |

# THE PERSON-NUMBER SYSTEMS OF SWEDEN, NORWAY, DENMARK, AND ISRAEL

Anders S. Lunde, Ph.D., Stig Lundeborg, Gerd S. Lettenstrom, Lars Thygesen, and Judith Huebner[a]

## CHAPTER I

## DEVELOPMENT OF THE PERSON-NUMBER SYSTEM

### INTRODUCTION

By the beginning of the 20th century many western European nations had established population registers that involved the continually updated systematic registration of the population primarily by name, residence, age, sex, and marital status. Originally, these were local registers administered at the municipal, county, or province level. By the middle of the 20th century, a movement to centralize the registers had begun and, while the local systems were kept intact, data from the local register offices were provided to Central Population Registers (CPR's), which were usually maintained at the national statistical office.

The primary reason for establishing population registers was to maintain reliable information for administrative purposes, particularly for program planning, budgeting, and taxation records. The registers also were useful for developing voting and education registers, maintaining social insurance and welfare files, and supporting police and court references. The registers eventually proved useful for the development of population statistics, especially for studies of internal migration, but also for research in many areas, including health statistics.

Although the product of the early local registers could be accumulated for national administrative purposes and statistics, this task was difficult and time consuming. The punch-card system, used for large-scale periodic statistics, was often operated through regional punch-card centers. The development of the CPR's coincided with the methodologies provided by electronic data processing (EDP), which greatly increased the potential for data handling, storage, and retrieval, and provided for national magnetic data-tape registers of the population. The CPR's also simplified certain problems of control and data quality because the management of the system was centralized.

At first, individual registration forms and the resultant lists of persons were coded by various coding systems using name and residence. Numbers assigned either randomly or sequentially by date of entry into a file were also used. Local registers and other institutions developed separate file codes. When CPR's were created, their efficient operation required that each individual

[a]National Center for Health Statistics, National Central Bureau of Statistics (Sweden), Central Bureau of Statistics (Norway), Danmarks Statistik (Denmark), and Ministry of Interior (Israel), respectively.

be defined by a single, universal code. As computers were used, a universal numbering system was developed and each individual was given a Person Number (PN).

Numerals are preferred as the primary referrents or standard identifiers in data-base computer systems, because computer operations are based on a numerical system and any other codes must be translated into a number for computer applications. If more than one code is applied to the records of a single individual, the chances of error are increased. A unique and universal number is efficient and easy to handle for comparing and sorting, storage capacity is increased, and record matching and linking are considerably improved.

## THE PERSON NUMBER AND ITS USE

The term "Person Number" refers to the *entire personal identification number* used in the national statistical systems of Sweden, Denmark, Norway, and Israel. This number will lessen the confusion caused by using either a "birth number," a "personal identity number," an "individual identification number," or a "CPR number." The commonly used "birth number," for example, may be most confusing because it may refer either to a random number provided at birth or to a number that includes a birth date. The Scandinavian countries also differentiate between a six-digit number based on birth date and a three-digit birth number ("individual" digits).

The PN, as a computer file key, has the characteristics of uniqueness, permanence, reliability, and universality. It is unique and independent because it is the sole identifier for one particular individual and for that person alone. It is permanently assigned, therefore, no duplication should occur. Although several numbers relating to an individual might be linked in a file, each additional item and operation adds to possible error. The PN is reliable in the sense that the system provides for such quality controls that the correct number appears on the named person's records. It is universal because it is one identifiable unit in a universe of numbers.

In a typical population numbering system, the PN is placed on all pertinent documents in the national data system. As a basic source, or data base, the system may act largely as a census in which persons are defined by a select number of characteristics or events. This data base is continually updated by the addition of births, subtraction of deaths, addition of immigrants, and the removal of emigrants—a classic demographic formula. The data base also can provide information on marriage and divorce and other personal particulars or events. These data are required for national assessment and program planning.

The PN is placed on documents and becomes a file reference in many clerical operations and statistical systems in public administration. These systems often develop their own data files and, using the PN, they either may update their information from the CPR reports, or they may attain direct integration with the CPR to combine the information in their files with information from the CPR. Data from censuses and vital statistics registration systems may be integrated to achieve current population statistics. Some countries are planning central registers and archives with the capacity for integrating many forms of data for public administration. The technology to achieve these goals has been available for some time.

Although the PN systems have become indispensable for public administration in the countries in this report, their potential for important research has not been fully realized. Sweden, in designating a ready-made survey frame by selecting the records of all persons born on the 15th of the month, has been able to take surveys of socioeconomic importance. Norway and Denmark are engaged in significant occupational mortality studies by PN linkage to death, medical, and census records. The National Institute of Child Health and Human Development is supporting a study, remarkable in its details, entitled "The Outcome of Successive Pregnancies for Norwegian Women 1967-1976" (see appendix VI). A unique numbering system affords the possibility of automatically linking records from the Medical Birth Registry, which gives details on pregnancy experiences and births as well as family histories of diseases, with the

death files, which provide data on the causes of death of infants under 1 year of age, and the census file, which provides statistical background data on the mother and father. No reference to individuals is made in these studies.

Government agencies and central statistical bureaus are well aware of the possibilities for linking statistical information to obtain new insights into areas of fertility, mortality, morbidity, and health services (see appendix VII), but they are prevented from pursuing these lines of inquiry because of budget and priority restraints. University and institute research groups undoubtedly will increasingly refer to CPR data and data from various subsystems. Government regulations generally permit the use of statistical (not individual) data for research.

## CONSTRUCTION OF THE PN

The PN is constructed in accord with standard computer practice for checking and correcting errors in the number, which includes the addition of check digits. The check digits are calculated by means of Modulus 10 or Modulus 11 algorithms computed on the basis of the other digits. With one check digit, 1 out of 2,000 errors will pass through the central system; with two check digits, 1 out of 100,000 errors will pass through. In the Scandinavian countries, the PN is constructed with an initial six digits for day, month, and year of birth; in Sweden, the order is reversed. Three file numbers or individual digits, numbered 001-999, follow. Odd numbers stand for males and even numbers for females. In Denmark, the first digit represents the century of birth. In Norway, persons born in the 19th century are assigned numbers 749-500 and those in the 20th century 499-000. Israel has a PN of nine numbers, assigned at random and including one check digit. This number has no cue for age or sex.

Table A gives examples of PN's. (See also appendixes I through IV.)

For complete coverage of the population, the PN is provided at birth and remains with the individual until death. Even after death reference can be made to data concerning that person, for example, in a retrospective study of the outcome of disease. Israel has had the unique experience of providing a PN to each individual in a new population and to thousands of immigrants since 1948, and it has served as a key to needed social services. However, the Scandinavian countries centralized their numbering systems only in the last decade. Remarkably,

Table A. Examples of Person Numbers: Sweden, Norway, Denmark, and Israel

| Country, number, and identification | Date of birth | | | Individual digit | Check digit |
|---|---|---|---|---|---|
| Sweden | | | | | |
| 450410-1488 (female born Apr. 10, 1945) | 45 (year) | 04 (month) | 10 (day) | 148 | 8 |
| Norway | | | | | |
| 260597-65131 (male born May 26, 1897) | 26 (day) | 05 (month) | 97 (year) | 651 | 31 |
| Denmark | | | | | |
| 030636-1171 (male born June 3, 1936) | 03 (day) | 06 (month) | 36 (year) | 117 | 1 |
| Israel[1] | | | | | |
| 041148883 (registered person) | ... | ... | ... | ... | 3 |

[1]Random number is assigned.

in less than 10 years, their systems have become firmly established and completely basic to public administration.

## SELECTION OF THE COUNTRIES

The Scandinavian countries and Israel are forerunners in the development and application of a unique PN system in national statistical systems. In these countries the PN has not only been used for civil administration, but also has been extended into several research areas. Norway, Sweden, and Denmark are now engaged in research in health and related areas. Israel has used the PN system differentiy from the northern countries, and its plans for the system are extensive. Because of these developments, Norway, Sweden, Denmark, and Israel were selected for study.

Considerable international interest in a PN system exists, and many other countries have either established such systems in part or plan to do so. The question of whether to establish a PN system has emerged in all developed countries, and some developing countries have even established the system in the laws of the land. The status of these systems is discussed in chapter VIII.

The report deals individually with the experiences of Norway, Sweden, Denmark, and Israel. Although the data processing aspects of the numbering systems are very similar, the discussion of each country will differ because each author emphasized matters peculiar to his or her country. These areas of emphasis collectively provide a broad overview of numbering systems operations.

Chapters on the four countries are followed by evaluational chapters in which the advantages and limitations of numbering systems, the problems of confidentiality and privacy, and the status of numbering systems throughout the world are discussed.

CHAPTER II

# THE PERSONAL IDENTIFICATION NUMBER IN SWEDEN

## INTRODUCTION

In Sweden, the administrative functions of the Government are largely delegated to central administration boards, each representing different areas of competence. One such authority, the National Tax Board, is concerned with population registration and the administration of the Person Number. Actual registration procedures are carried out by the Church of Sweden, which is the state church, by using a system that is approximately 300 years old. The local clergyman is the registrar, and his registration district is the parish. There are 2,500 parishes in Sweden. The clergyman also acts as the local census official. In the local population registration system, individuals are listed according to their place of residence in relevant ledgers and registers. A separate record is kept for each individual, is updated annually, and follows a person throughout his life. The records of deceased persons are kept in a historical file.

Every person living in Sweden on January 1, 1947, was assigned a personal identity number (PN) in the county of registration. Since then, each of the 24 county administrations has kept a register of the resident population. In 1967, these records were transferred from metal plates to magnetic tape (personal-data tape). The county registers contain a person's name, personal identity number, birth date, place of birth, parochial registration locality, and address. The data also include information on marital status, date of change of marital status, citizenship, legal incapacity, and membership or nonmembership in the Church of Sweden. There are also codes relating to pensions, conscription, merchant navy register, and income tax. Local parochial registration offices send personal-data cards containing pertinent changes to the county administration. The county administration also supplies data to other bodies such as the local tax authorities, the Social Security Administration, and the defense authorities.

## OPERATION OF THE PN SYSTEM

The main function of the National Tax Board is to supervise and organize the work of the local and regional authorities. It is responsible for systems design, programming, and the development of the various routines to be administered by the regional and local authorities. The National Tax Board issues birth numbers ranging from 001 to 929 to the county administrations to be assigned to newborn children. Birth numbers from 930 to 999 form a reserve series used by the National Tax Board. The first set of birth numbers is usually sufficient to cover the number of births per day in each county but, if it is not, numbers can be taken from the reserve series. When a county administration is notified of a live birth by the local parochial registration office, it assigns the first vacant birth number from the county administration digit series to the child [illegible] day of birth. Odd numbers are used for boys and even ones for girls.

Not only the newborn, but also other categories can be assigned a PN by the National Tax Board. One example is the immigrants who have registered in a parish, who have not previously resided in Sweden, and who have not

already been given a number. When an immigrant registers at the parochial registration office, the latter informs the National Tax Board and requests a number. The board checks to determine whether the applicant has been given a number and, if not, it assigns one. A person who has been assigned a number at any time in the past will be reassigned his original number. Since 1969, PN's have also been assigned to persons who have come from abroad to work but who have not stayed long enough to be registered at the parochial office as living in Sweden. The National Tax Board will assign such a person a number either when it issues him a preliminary income tax return or when he enrolls in the social insurance scheme. There are other minor categories of people who may also be given PN's for special registration, for instance, Swedish citizens living abroad who apply for a Swedish passport and who have not previously been given a PN.

## INTEGRATION IN THE NUMBERING SYSTEM

The magnetic-tape file of the population kept at the county administration office is arranged according to PN's with the oldest number issued first and the newest number issued last; this file is updated once a week. Data concerning members of a family are linked; a husband's record will contain a note with his wife's PN and vice versa. The record of a person under age 18 will contain a note with the PN of the head of the household. This method enables a combination of data concerning members of a family living together. The record for every person in the file contains an identification number for the county, the municipality, the parish, and the real-estate unit where he resides. This number relates to a special magnetic-tape register of all the real-estate units in the county. The population files and the real-estate files can be matched, and the information integrated. A list arranged by all the real-estate units and the persons inhabiting them is compiled periodically so that the exact legal domiciles of each individual can be established for the coming year.

The population file is also used as the basis for the tax file, which is kept by the county administration and contains all significant information about taxes and their collection. A taxpayer's identity number is the same as his PN plus the two-digit code of the county where he lives. In this way the population file and the tax file can be integrated. For various official purposes full integration can be achieved between the population file, the tax file, and the real-estate file via the PN and the real-estate identity number.

## USE OF THE PN

In Sweden, the personal identity number is used extensively in public administration. At the outset, the PN was used primarily as a more efficient way to identify individuals. Since the introduction of computers in population registration and taxation applications, the numbering system has become a necessary, fundamental element in the maintenance of an accurate and efficient public administration system. The identity number has become the key file number in various subsystems and is placed on all pertinent records of the individual. Specific uses are as follows:

A. General
   1. Population registration
   2. Taxation
   3. Military service (Military Register)
   4. Civil defense
   5. Social insurance (National Social Insurance Board)
   6. Education/school register (local education committees, school boards)
   7. Health services (hospitals, patient medical records)
   8. Passports (National Police Board)
   9. Registers of motor vehicles and driving licenses (National Car Registration Board)
   10. Insurance companies, banks, and other organizations

In Sweden, other official or nonofficial bodies use the PN in their

register of employees, clients, policy holders, and so forth. In some cases, the central administration permits notification of changes of address to these organizations.

B. Health

1. Vital statistics
2. Health statistics

### Social Security Insurance System

The social security insurance system (chiefly, health insurance, parents' insurance, national retirement pensions, and supplementary pensions) is administered by the National Social Insurance Board and the local social insurance offices. A comprehensive advanced data processing (ADP) system has been developed for this administration and is used not only for social security insurance but also for certain other allowances and benefits. The ADP system, and consequently the social security insurance administration, is based on the fact that the insured can be identified by their PN's.

The personal identity numbers serve as keys or links among different registers and with PN's as identifiers, these registers can be brought up to date quickly and simply. The local social security insurance offices are continually in touch with current information in the central registers via display terminals at approximately 500 central and local insurance offices. In the terminal communication system, the PN is used as the identifier.

With this number, data can also be exchanged with other authorities, and social security benefits can be transmitted simply and safely.

### Health Services

Various patient booking systems that are now being established in the health services are based on the PN. When a patient visits a hospital for the first time, he is issued a patient-attendance card, which is a metal plate stamped with his PN, name, and other information. This plate is used to identify the patient for all hospital services. The PN is also used as the identifier on a patient's medical record—a document that the health services are legally obliged to keep. The PN is also frequently used as an identifier in various kinds of health services staff administration registers such as those of physicians, nurses, and paramedical personnel.

### Vital Statistics

Every week the county administrations notify the National Central Bureau of Statistics (SCB) of changes in their population register concerning births, migration, deaths, and marital status, and PN's are used as the means of identification.

The SCB gathers information in a register system called the Register of the Total Population (RTP) which includes all persons entered on parochial registers in Sweden, and which is updated at regular intervals. Apart from PN's, it not only contains the majority of the county administrations' population data, but also contains certain data on income and taxes. The main object of this register is to serve as a base for the production of statistics concerning individuals. If the Data Inspection Board has given its permission then it is possible, by using the PN as a matching device, to carry out the joint processing of statistical material within the area and to reduce the number of variables that have to be collected in certain other sets of statistical material.

This register also provides a framework for statistical samples. The individuals selected in the sample can be linked by their PN's to any other available information pertinent to the survey.

Sweden's population statistics are based on the Register of the Total Population system.

The PN serves as the key to matching and duplicating in the following manner:

To check duplication of notifications

To check notifications of multiple births

To compile tables showing rates for emigrants according to the duration of

their stay in Sweden (the immigrant register is matched against the emigrant register)

To compile tables showing rates for those who have received Swedish citizenship according to the duration of their stay in Sweden (the immigrant register is matched against the register of those who have received Swedish citizenship)

To compile migration statistics for municipalities relating to 5-year periods in which those who have moved over a municipal boundary once are recorded separately and those who have moved both in and out are recorded separately (in-migrants are matched against out-migrants)

To produce migration statistics, for example, for 1970 and 1971 from data from the 1970 Census of Population and Housing on items such as occupation, type of economic activity, education, and income (the 1970 and 1971 migration register was matched against the 1970 Census of Population and Housing)

The PN's have been used in censuses of populations since 1960, primarily as a matching device. Their use has steadily increased as more information from the censuses has been gathered from the register material. Consequently, the number of facts collected directly from the general public has been reduced.

The PN's are used as matching devices in other areas of population statistics in Sweden, for example, the SCB's Register of Deaths and the Register of Persons Born on the 15th of the Month. The latter register comprises about 3 percent of the population. The register contains demographic data (including migration) pertaining to those born on the 15th and to the husband or wife and children living with the individual. In addition, it contains data relating to income and economic activity (according to a rough breakdown) for the individual and his or her spouse. The register has been used chiefly for sample surveys of fertility, migration, and changes in income at both an individual and a family level, as well as a sampling frame for interview surveys.

The Register of Deaths contains data from the 1960 Census of Population and Housing and from the annual mortality data for 1961-70. Data on demographic features, occupation, economic activity, educational level, and so forth, from the census are linked to mortality data such as place of residence at the time of death, date of death, and causes of death. This linkage enables both the combination of data and the study of mortality in any population that can be defined by means of census data. The Register of Deaths is expected to be of great interest in epidemiological studies.

### Health Statistics

The PN's are used as identifiers in a number of registers in the public health sector. They are used as matching devices in the various registers to enable data supplied on different occasions regarding the same individual to be interrelated. The registers have many uses including statistics in special surveys. The National Board of Health and Welfare is primarily responsible for Sweden's central health statistics. The PN's are used in the following major registers among others:

1. Statistics on patients
2. Notifications on the medical aspects of births
3. The Cancer Register
4. The Register of Gynecological Medical Examinations
5. The Register of the Side-Effects of Medicinal Drugs

*Statistics on patients.*—Statistics on patients are compiled mainly to obtain information for administrative planning. The primary data consist not only of the patient's PN, but also of particulars concerning medical diagnoses and operations when the patient was in the hospital. The PN's permit (1) the identification of the data record so that supplementary material may be obtained and particular items can be checked and corrected, (2) the computerized linkage of several different periods when a patient received medical attention, and (3) the computerized supplementation of data from other registers.

Furthermore, the existence of PN's increases the opportunities for the use of statistics in special surveys, for instance, epidemiological research. The statistics on patients have another function regarding the side effects of medicines: to draw attention to the adverse reactions to drugs because information is accessible from patients' medical records. The PN's facilitate such a search.

*Birth Notification.*—The medical aspects of births are registered partly to provide a foundation for medical statistics of deliveries, as a planning base. This form of registration also enables retrospective use of data to detect groups among the newborn that are at risk. The register contains numerous medical data concerning the mother's state of health during pregnancy, the course of the delivery, and the state of health of the newborn child. The mother is identified in the register by means of her PN. The newborn child's number is not added until the register is updated which is about 8 months after the register year has expired.

*Cancer Register.*—The Swedish Cancer Register (see appendix V) was established in 1958. In 1978, permission to supplement the register with data from the Population and Housing Census was granted by the Data Inspection Board. Persons registered in the 1961-73 Cancer Register and the 1960 census were identified in both registers by their PN's, and the Cancer-Environment Register was compiled by merging both registers.

Although the Cancer-Environment Register is primarily intended for research, it also has another function, which is to point out potential health hazards. This register has been widely used as a gateway to various research projects. Recently it has proven to be of major importance in investigations of the relationship between the occupational environment and the origin of tumor diseases.

Data on a cancer case are collected from three different sources: (a) clinics, (b) pathologists/cytologists, and (c) mortality statistics. The PN is not always available on records from the first two sources. Compilations of data from clinics and pathologists/cytologists are made manually with the individual's birth date and name as identifiers. The PN's are later checked and supplemented by comparing them with a microfiche register of the total population of Sweden. The data are then registered by computer, and the data from the mortality statistics are transferred by joint computerized processing with the PN as the identifier. The register is updated continuously when there are additions or corrections. The PN is used as the identifier in updating the register. For identification purposes all or part of a name is also registered. The name is necessary, for instance, in cases where it has not been possible to obtain complete personal identity numbers.

*Gynecological Medical Examinations Register.*—To supplement the Cancer-Environment Register, the National Board of Health and Welfare keeps a register containing data from gynecological examinations under the aegis of the county councils. Those asked to submit to these examinations are selected from the population registration system. The use of PN's in these examinations enables monitoring a woman's state of health regarding cancer and making followup assessments.

*Medicinal Drug Register.*—The Register of the Side-effects of Medicinal Drugs should provide information speedily about side-effects that may have been caused by a certain medicine. To enable patients to be followed scientifically, their PN is necessary.

The PN's are also used in registers and surveys carried out by bodies other than the National Board of Health and Welfare, such as the Tuberculosis Register, which is kept by the National Association for Cardiac and Pulmonary Diseases, and the registration by the National Bacteriological Laboratory of notified cases of diseases that are a danger to the general public.

## TECHNICAL AND OTHER PROBLEMS

Apart from the problem that the system is not entirely self-checking, no serious technical problems are apparent. However, immigration from countries having an imperfect population registration has given rise to a problem for a system with PN's based on dates of birth. If an immigrant does not know his date of birth, he is assigned a PN based on an estimated date of birth. If such a person emigrates from Sweden

and then immigrates into the country again, there is the danger that he may be assigned a new PN. Another problem is that people from countries with imperfect population registration systems who do not know their date of birth often say they were born on January 1st. The result may be both confusion between individuals and an uneven distribution in registers of individuals indexed by PN's.

The problems that arise in the use of the PN are those related to the statistical processing of material where PN's have been used for identification. Such use of PN's became firmly established in various registers and surveys during the 1960's. One reason was that these numbers made it possible for various sets of material to be processed together and, therefore, for better utilization of information. Respondents no longer had to be asked for the same information repeatedly. The production of statistics could be made more efficient.

Three elements surfaced when this new method of statistical production began to be implemented: (1) members of the general public either did not know their own PN's or they gave the wrong or incomplete number due to a memory lapse; (2) the quality of the number was not satisfactory; and (3) not everyone had been assigned a PN, for example, foreign students studying for a short period in Swedish schools.

In the 1960 Census of Population and Housing, PN's were used, and errors sometimes arose that prevented a correct linkage between data from the national registration and data from the special Census of Population form. Consequently, the national registration data for one individual might be entered with the population data of another. Similar errors arose when these data were being processed jointly with other sets of material. These errors were a combination of circumstances: an individual, when filling in his statistical form, might copy his PN incorrectly or errors might remain from 1947 when PN's were introduced for the population of Sweden. At that time the check-digit system had not yet been introduced.

Over the years, the majority of the errors occurring in PN's were corrected by the population registration authorities, and the check-digit system was introduced. Because of the widespread use of PN's in administrative material, members of the general public have become increasingly aware of the value of remembering their number and of being able to look it up easily. Consequently, errors in these numbers are now very rare compared with the 1960's.

### Solving Problems

Regarding problems that may arise in a statistical survey due to errors in PN's, such errors can now be rectified in various ways. The manner of discovery of the error must be determined. Most errors are discovered by the check-digit system when the material is being registered by computer. Others may be discovered in the actual survey process, for instance, in an interview survey where the survey population and certain basic data are gathered from previously collected material using PN's. When matched in the computer, the data of those selected for the survey are supplemented by an individual's name and address from a register that is kept by the population registration authorities. The particulars are then sent to the various addresses. If an individual finds he has been sent incorrect data, he will usually inform the sender. The identity of the person who was originally selected can be traced by analyzing the data in the survey where the selected individual gave the wrong PN. If that survey contains additional particulars to identify this individual, he can be found. This work, however, is time consuming and may not always be feasible because of a shortage of resources. Therefore, the errors may, instead, reduce the number of individuals in the survey by leading to nonresponse. Nevertheless, this problem is not insurmountable.

A different way of solving the error-problem is to use additional identification devices when processing the material. However, this course is not taken frequently in statistical surveys; it is chiefly used in administrative contexts where errors in the joint processing of registers may have unfortunate effects in personal affairs, for instance, if children's allowances, pensions, and so forth are sent to the wrong person.

## FUTURE ANTICIPATED USE OF THE PN SYSTEM

The National Tax Board and the National Office of Organization and Management (see chapter VII for a more detailed explanation of the National Tax Board and the role of the Data Inspection Board) are developing proposals for a new ADP system for the registration of the population, taxation records, and tax collection in the future. Parliament has decided that these proposals should be implemented. The new system is to be adopted in stages. The first stage, which is concerned with taxation records and tax collection, was introduced in 1979. A committee to examine the question of a future census for population and housing was established and charged to examine the feasibility of using more extensively data found in various administrative sectors such as the administration of taxes and the registration of real estate. Because there are many registers with the same PN in the country, it was thought possible to base the collection of data on the information available in them. The committee completed its work at the end of 1978 and made recommendations regarding the use of registers concerning the 1980 census. Although the supply of information from the existing registers could be considerably expanded, it was not sufficient to provide all data needs. In the spring of 1979, Parliament agreed on the plans for the 1980 census by largely following the recommendations of the committee.

The work of studying the feasibility of using registration data will continue. The National Central Bureau of Statistics has been charged with determining ways to obtain data other than through the collection of census forms, such as through population registers and data linkage.

## CHAPTER III

# THE PERSON-NUMBER SYSTEM IN NORWAY

### INTRODUCTION

As in Sweden, local recording of births, deaths, and marriages has been undertaken in the parishes of Norway since the 17th century. Local population registration offices were established only in the 20th century; the first was in Oslo in 1906. The principle functions of these offices were to administer taxes and to process information on where people lived and where they moved. During World War II, on March 1, 1943, the occupation authorities ordered all municipalities to establish registration offices. After the war, the Act of November 15, 1946 (revised in 1970), maintained the practice of universal registration. On January 1, 1965, the registration offices were centralized under the tax authorities and administered by the Central Bureau of Statistics.

During the 1950's the growth of electronic data processing (EDP) led to an increased interest in developing computerized statistical file systems. Public institutions developed such systems and frequently used personal identification numbers as key identifiers. These systems were not uniform, and the reference numbers differed. The need for a standardized national numbering system for efficient public administration was recognized. The Central Bureau of Statistics in 1961 was asked to establish and maintain a national identification numbering system, and the Central Population Register (CPR) was established October 1, 1964.

At first, the register was composed of all residents of Norway on November 1, 1960, the date of the 1960 census, and all persons who immigrated or were born between November 1, 1960, and October 1, 1964. Since the latter date, all children born in Norway and all persons immigrating to Norway for the first time are assigned a PN.

Norway maintains another major register, the Register of Establishments and Enterprises, started in 1956 and based on a 1953 census of industrial establishments. Two series of identification numbers of six digits and one check digit are used in the files. Partial registers for industrial establishments and statistics of accounts are produced from the central register, as well as, statistics of wholesale and retail trade.

### CHARACTERISTICS IN THE SYSTEM

The CPR is kept on magnetic tape. The record length is fixed. Certain characteristics are kept in the situation file (see table B).

Table B. Characteristics maintained in the Central Population Register situation file

| Characteristic | Number of digits |
|---|---|
| Identification number | 11 |
| Municipality | 4 |
| Name | 26 |
| Address (name of street, road, etc., and number) | 30 |
| Postal district | 4 |
| Type of registration (resident, deceased, etc.) | 1 |
| Marital status | 1 |
| Identification number of mother | 11 |
| Identification number of father | 11 |
| Date for type of registration | 6 |
| Identification number of spouse | 11 |
| Family number | 11 |
| Date of removing day | 6 |
| Nationality | 3 |
| Migrated from/to country | 3 |

## ORGANIZATION OF THE FILES

The CPR is organized into five files:

1. *The situation file* contains the acutal values of the characteristics for each individual on a given date.
2. *The report file* contains all entries about birth, migrations, changes, or corrections in characteristics after a given date. It also contains the dates of these events.
3. *The chronology file* contains the most recent value of each characteristic as well as the date of the latest change in the characteristic.
4. *The history file* contains the old values of characteristics that have changed as well as the dates of these events, and has the same formal structure as the report file.
5. *The statistic file* contains data from various reports that are used to produce statistics. Some data are taken from the chronology file, but most are taken directly from the reports.

## OPERATION OF THE SYSTEM

The registration office keeps a written card for each resident in the municipality. This card contains the same data as the CPR. When a person moves from one municipality to another, he or she has to notify the authorities within 8 days. The move is registered in the municipality to which the person has moved, and the registration office in this municipality requests this person's card from the registration office in the municipality from which he or she has moved.

The registration offices get reports from hospitals, clergymen, local authorities, and individuals about births, deaths, marriages, migration, and other events. The registration offices update their own registers, supply the reports with necessary identification numbers, and send reports to the Central Bureau of Statistics once a week. The registration offices also keep a separate register on magnetic tape. This register contains some characteristics that are not included in the CPR such as information on occupied houses. The registration offices have a number to identify every house in the municipality. This number provides information used in local and regional planning. This local register is updated once a week by separate reporting routines.

## UPDATING OF THE CENTRAL POPULATION REGISTER

Each week the Central Bureau of Statistics receives reports from the local registration offices concerning the following items:

1. Births
2. Marriages
3. Deaths
4. Internal migration
5. Movements within the municipality
6. Immigration
7. Emigration
8. Inquiry about registration problems
9. Missing persons
10. Paternity to children not born in marriage
11. Name
12. Adoption
13. Separation/divorce
14. Changes in the family number
15. Correction of characteristics in the CPR
16. Alteration in names of streets/roads
17. Naturalization
18. Changes in marital status

These reports are divided into three different categories: new units in the CPR, alterations in the value of characteristics in the CPR, and corrections of erroneous characteristics. When receiving these reports, the Central Bureau of Statistics makes a brief check on the material, and any revisions are keypunched. Then, various

logical controls are performed on the material. Once a month a chronology control is performed, and the CPR is updated.

## USE OF THE PERSON NUMBER

The national PN system is used in administrative routines, in the production of statistics, and in research projects.

### Administrative Use

Several public authorities and institutions use or have reference to the numbering system. Examples of such organizations are the taxation authorities, the Health Administration, the National Insurance Administration, the Directorate for Seamen, the Road Administration, the Defense Department, and the Administration of Elections. Also, some private institutions (mostly banks and insurance companies) are permitted to use the PN system.

### Use in the National Insurance System

The PN is now used in all parts of the National Insurance System. This system comprises old age pensions, disability pensions, benefits for occupational injuries and rehabilitation, benefits during sickness, survivor's benefits, and family allowances. This system is financed partly by the national budget and partly by premiums paid by employers and employees. The insured person pays his premium through taxation, and the amount stipulated is a certain percentage of his income. The amount paid to the insured either as a pension or as benefits during sickness is related to his income.

In the old age pension and disability pension plans, a person is given points for each work year based on his income. Points are stored over years and identified by the PN. At retirement, the pension is fixed on the basis of points for the 20 most favorable years. For persons not attaining points for 20 years, separate rules apply. Separate rules also relate to disabled persons.

On July 1, 1978, a revised system was introduced for payment of benefits during sickness. Regulations state that the employer shall pay for the first 2 weeks of sick leave. If the duration of sickness (absence from work) exceeds this period, the insurance office shall pay.

Control of cases when benefits during sickness are given is possible because a register has been established comprising employers and employees. Employees are identified by the PN in this register, and employers are given a separate employer's number.

Benefits during sickness are taxable income and are also regarded as pension-producing income. Notifications sent from the insurance system to the taxation office are identified by the PN.

### Use in Vital and Health Statistics

Reports used for updating the CPR are also used in the production of statistics, especially vital and health statistics. Most of these data are taken directly from the reports after they have been processed in the register system and have been transferred to the statistical file. In addition, the reports are supplied with data extracted from the register by record linkage.

In internal migration statistics, marital status and municipality from which the person has migrated are taken from the CPR.

Extensive use of the birth-number system is made in producing birth and death statistics. For births and deaths, two sets of reports are collected: one contains information primarily for civil administrative use, and another contains medical information. Although civil reports on births are first sent to the local population register and then to the Central Bureau of Statistics, the medical reports are sent to the Medical Birth Registry established in 1967. To supply this medical register with the birth number for infants and parents, records on tape from the CPR are linked each month with the medical reports related to the mother and child. In addition to transferring identification numbers to the medical register, this linkage also reveals cases where civil or medical reports are lacking. This control is important for birth statistics because dead fetuses and live-born infants who die shortly after birth are not always reported in the civil registration system.

In the production of death statistics, medical reports and civil reports are linked by birth and death dates. Through this process, lists are prepared mechanically on nonmatching death records. In addition, duplicate records are listed. After checking the lists (and correcting the errors), medical reports that are missing are obtained to complete the data on the causes of death. The CPR is also supplied with deaths that are not reported on the population register. With this process, a complete file on deaths can be produced as an accurate basis for death statistics. The complete file on deaths is linked with the CPR to obtain the name of the deceased. This register file is used for production of a national death index that can be used for death clearance by all institutions.

Once a year, a situation file of the CPR is used to produce tables showing population by sex, age, and marital status in each administrative unit. By using the PN, sex and age can be directly obtained. Furthermore, tables are produced separately for the foreign population based on the characteristic for citizenship. The PN, which also is the basis of the family-number system, makes it possible to link persons with family nuclei. Family statistics have been produced twice (1974 and 1977) and will now be produced every other year. The birth number will also be used to add data on education and income to the family records.

Moreover, the PN is used in the registers established for physicians and dentists. By linking these registers with the CPR, data on marital status, residence, and other information can be added and used for statistics. These two registers are also linked with the taxation file to produce income statistics for physicians and dentists.

### Use in Research

The purpose of establishing a history file was to provide research units with the possibility of developing studies, such as those based on cohorts, showing how demographic characteristics have influenced demographic events.

The Central Bureau of Statistics has started work not only on projects concerning migration, but also on projects monitoring changes in marital status for population projections. Furthermore, cohorts of marriages have been followed regarding the number and the spacing of births.

More frequently, the PN system has been used in research projects based on record linkage of data from different sources. The population census of 1970, which includes very detailed information on education, occupation, housing conditions, and other specifics, has been linked to demographic as well as economic data.

In the field of vital and health statistics, several items were analyzed on the basis of record linkage.

Divorces for the period 1971-73 were linked with characteristics of the married couple at the time of the census and with data from the taxation file to show the influence of occupation, housing conditions, education, and income on divorce. The results were published by the Central Bureau of Statistics in 1975.[1]

Cause of death from the censuses from 1970 to 1973 inclusive was linked with occupational data. Standardized rates showed marked differences in mortality according to occupational group. The results were published by the Central Bureau of Statistics in 1976.[2]

To extend the basis for calculating mortality for occupational groups, mortality data were linked with occupational data for both 1960 and 1970. Deaths among persons economically active in 1960 but not in 1970 were included. For special groups, such as persons who remain in the same occupational group for a long period, more reliable data will be presented in the future. The tables processed will be analyzed and published under the title "Occupational Mortality."[3]

Record linkage with census data has also been undertaken for research units outside the Central Bureau of Statistics (see appendix VI). In these cases the linkage is made in the Central Bureau of Statistics and only tabular results are available. For instance, data from the Cancer Registry have been linked to occupational data. A recent analysis was made by linking medical birth register data (perinatal deaths, preterm births, and congenital malformations) to census data (occupation and education of mother and father). Possible connections between working conditions and related factors concerning parents and conditions during pregnancy, at delivery, and future developments in the infant were

traced. The results will be published in one of the official statistical series in 1980. Because the PN is included in the 1960 and 1970 censuses, record linkage has been undertaken to follow the resident population at both censuses for changes in characteristics.

### Problems in the System

*Technical problems.*—When the Central Bureau of Statistics was asked to establish a national PN system it was assumed that the number would contain the date of birth as a memory aid. However, in establishing the register, a number of errors in the date of birth were introduced. When these errors were discovered, the persons involved were given new numbers. This occurrence caused some technical problems when matching files from different periods.

The PN *per se* contains three individual digits. Three digits can provide 999 individual numbers on a specific date, of these, 250 are used for persons born in the 19th century and 250 are stored for future use. Because a large number of immigrants give their date of birth as the 1st of a month, in particular January 1, the available individual numbers may be too few.

A general problem connected with storing data—the problem of converting data from one system to another—has caused additional work. In the CPR, the family number for each family nucleus is the birth number of the head of the family. Thus, when the value of the characteristics in this birth number changes, the value of the characteristics in the family number also changes.

*Other problems.*—A better CPR is increasingly needed. Working continuously to improve the quality of the characteristics data is one way to meet the demand for better information. Another is to improve the means of updating the register. This method has proved difficult because the comprehensive control system to update the reports is overly complex. The CPR should be updated once a week instead of once a month.

One special problem refers to migration. Everyone is required to report a migration to the local registration office within 8 days. However, some people do not report them.

The time from the occurrence of an event to the time the report is received in the CPR is often too long. Simplified and rational report routines are being developed to make this interval shorter. Also, possibilities for better EDP-routines are being considered.

The CPR contains only one concept of address, that is, the address where the person lives. Some authorities and institutions use a postal address such as a postal box number, which can differ from the home address. Technically, several addresses can be established as characteristics in the CPR.

Training the staff of the local registration offices is needed. The work in these offices associated with the CPR is growing more complicated, and the responsibility of each employee has expanded. To solve these problems the Central Bureau of Statistics regularly organizes training meetings with the staff of the local registration offices. Over 4 years, all the local registration offices will have participated in these meetings.

All the problems in the CPR can be solved if resources are available. Plans for solving the problems are set up as part of the long-term planning program.

### Future Use

A broader use for the PN system will depend on three conditions: the development of the CPR, the expansion of the statistical file system, and the rules that the political authorities will make for the collection and use of personal data. The development of the CPR can proceed in two ways: first, by establishing completely new characteristics in the register, and second, by technically developing the register (e.g., putting the CPR on direct-access media and providing terminals to the local registration offices).

For the expansion of the statistical file systems, the central authorities are planning a new countrywide file system and its core will consist of the following three registers: a central estate register, a central building register, and a central address register. This register system will be linked to other central registers, such as the CPR. The main purpose of this statistical file system is to create an information system for

local and regional planning that will give new and wider opportunities for the use of the CPR.

More private and public institutions are expected to use the PN. This usage will provide the increased possibility of linking registers and will create further demands regarding the quality of characteristics in the CPR.

### Plans for Additional Studies and Research

The establishment and development of registers based on the PN system will certainly increase the possibilities, not only for more and better statistics, but also for studies based on record linkage. A register on health personnel is being implemented. This register now comprises physicians, authorized nurses, auxiliary nurses, and some special groups of nurses. All categories are identified by a PN. In information systems on patients in health institutions, the use of a PN will make it possible to follow persons through the health service system.

When the population census of 1980 is completed, a followup of the analysis of mortality and occupation will be undertaken.

CHAPTER IV

# PERSONAL IDENTIFICATION NUMBERS AND POPULATION STATISTICS IN DENMARK

## INTRODUCTION

In 1924, for reasons similar to those in Sweden and Norway, namely for the collection of taxes, police work, registration of electors, and population statistics, Denmark's Parliament passed the Act on Local Population Registers. All municipalities were mandated to establish local population registers, which would be files containing information about all persons residing in the municipality indexed by name, occupation, date and place of birth, residence, family circumstances, and citizenship. The municipalities were required to keep the files continually updated by information from various agencies on births, deaths, marriages, and divorces, and individuals were responsible for notification of changes of address. The establishment of a central register was debated, but it was not enacted. Eventually the population registers developed other functions; tax authorities and health insurance funds, for example, were notified about migrations of persons. These agencies also kept their own registers.

Electronic data processing (EDP) was introduced in 1968, and a Central Population Register (CPR), with a national magnetic data-tape register of the Danish population was established and included all the local population registers in one administrative system. The process involved the introduction of the personal identification number (PN). The CPR numbering system was extended to all sectors of public administration and replaced all other systems. In 1972, the system was extended to include Greenland. The CPR therefore contains information about all present and past residents in Denmark since 1968 and Greenland since 1972.

The CPR also contains information about nonresident persons who have some connection with Denmark, such as payment of taxes. The CPR only holds current information. Thus for changes of address, information related to the old address is deleted from the register. However, persons who either emigrate or die remain on the register with the data that were recorded either at the time of their departure or their death. A special historical register is also maintained and consists of about 6 million persons. Technically, the CPR today is stored in a data-base system with direct access to individual information. Keys for direct access are either the PN or the address. The register is updated 4 days a week.

The CPR is administered by the Secretariat for Personal Registration in the Department of Interior. One responsibility of the Secretariat is to instruct the administrators of the 294 local population registers on questions concerning updating and communicating with the CPR. Also, the Secretariat is responsible for keeping the technical system operational. The register is located at I/S Datacentralen, which is a publicly owned data-processing center. The responsibility for the coordination of the total statistical production rests with Danmarks Statistik, the Central Bureau of Statistics of Denmark. This office cooperates in the production of data with several authorities such as the Secretariat for Personal Registration, the National Health Service, local tax authorities, research institutes, and various government agencies.

## STRUCTURE OF THE CENTRAL POPULATION REGISTER

The CPR system is composed of several sub-registers including the person and the address registers. The former is the nucleus of the system, containing information on the previously mentioned 6 million persons identified by the PN. Personal data include name, address, place of birth registration, citizenship, as well as references to relatives (children, parents, wife, or husband) by their PN. Person Numbers are assigned to newborn children and corrections of wrong numbers are made automatically by updating the CPR with the correct date of birth and sex. Immigrants entering Denmark for the first time are provided with a PN. If they do not know their date of birth, they are assigned a year of birth, and the day and month of their registration are added. Between 1,000 and 2,000 persons disappear each year; most are foreigners who are presumed to have returned to their native lands. Others are mainly Danish citizens who will probably appear at some later time.

## GENERAL APPLICATION OF THE PN

The PN is used in public administration as a file number that serves as an accurate identification of individual persons. It is used in connection with all matters when the public authorities are involved: tax cases, payment of social benefits, hospitalization, admission to schools and institutions, purchase of real estate, military service, and so forth. By means of the PN the tax authorities, the social administration, and other offices can retrieve general personal data from the CPR system. Many branches of the administration have constructed special EDP registers that, apart from the CPR data, also contain personal data relevant to the various fields of administration. These special registers also use the PN as the file number, and the registers are constructed so that the general personal data are updated by automatic reports from the CPR. It is of special importance that the CPR can supply information about increases and decreases within the population group with which the administrative authority is concerned.

The special registers contain data different from that of the CPR because they are not meant for general use in administration and the specialized data seldom have the same degree of reliability. The more important public registers are the Tax Register, the Pension Registers, the Unemployment Registers, the Social Registers, the Hospital Registers, the Registers of Persons Receiving Education, the Registers of Real Property, and the Central Register of Enterprises and Establishments. Within the health sector, a number of registers make use of the PN. Hospital registers, just mentioned, store information about patients and their medical histories. In some counties, these registers are on-line systems used directly by the hospital staff in connection with patient treatment.

The Sickness Insurance Register, also kept by the counties, records information on insured persons (all adult residents in Denmark) and their health services. The National Health Service keeps registers on legal abortions, births, and deaths, largely used in medical statistics. Two specialized medical registers are the following: (1) the Cancer Register, where ½ million living and dead cancer patients are recorded, and (2) the Heart Register, where patients with acute coronary thrombosis are registered. These research registers are almost exclusively used for statistical analysis.

The PN, serving as the key to all systems, makes it possible to link data from different sources and subsystems. Only the public authorities can acquire information about the PN's and receive personal data from the CPR. However, the employers must know the PN's of their employees because they deduct withholding taxes. Another exception is that banks register the CPR numbers of all their deposit account customers. This legality makes it possible for the authorities to exercise an effective control over the taxpayers' information to the tax authorities about bank deposits and interest income.

### Population Statistics

The basis of the statistical use of the CPR is the current population statistics, which are the statistics on population size, composition, and

changes in births, deaths, migrations, and so forth.

Surveys of the total population and its composition are normally made once a year on January 1. The basis of the surveys is a complete copy of the CPR's register of persons and addresses compiled at the turn of the year by electronic data processing at Danmarks Statistik.

However, the delay in reporting births, deaths, and migrations is usually about 3 weeks from the time the change occurred to the time the information is properly recorded in the register. The population register will, therefore, never correspond to the resident population. These delays are taken into account because the population count recorded in the local population register on January 1, is adjusted regarding births, deaths, migrations, and so forth, that have taken place before January 1, but which were reported within the first 1½ months of the new year. By this period it is ensured that all reports, which are not subject to extraordinary delays, are included in the statistics.

The statistics of population changes are based on magnetic tapes with update records that Danmarks Statistik receives from the CPR. These change extracts must be subjected to an initial processing at Danmarks Statistik, when the change must be established in each individual case. It must be decided whether a change has actually taken place, or whether it is only a correction of wrong data. When processing change extracts, delays in the reports must be noted. In the current statistics, changes are transferred to the next period (year or quarter of a year) if they are reported later than 1½ months after the end of the period.

The birth statistics, except for the CPR data, are based on midwives' reports that are completed for each live birth in Denmark. The midwives' reports are not systematically provided with the child's PN, but both reports are given the mother's PN, which serves as a secondary identification so that all items of information in the midwives' reports can be linked automatically with the changes reported from the CPR.

Accordingly, the death statistics are prepared by a combination of data from two sources, namely CPR data and the original death certificates completed by physicians. The PN of the deceased is stated on both sources and is used for an automatic linkage of the data.

Certificates and reports are included as a supplementary basis because medical information about birth (for example, the inducement of labor) or about death and its cause are not contained in the CPR. The demographic variables such as sex, residence, and occupation theoretically could be taken from the certificates and reports, but by applying the demographic variables from the CPR, data handling can be reduced. Also, the birth and death statistics are coordinated with the other CPR-based population statistics. This system is most desirable because the number of deaths either by geographical area or by special industries should be seen in relation to the size and composition of the population in that same group.

### Other Applications

The PN is extensively used for statistical production where personal data from various sources are combined. As previously mentioned, such matchings are currently conducted in population statistics, but the possibilities of person-oriented matchings are numerous. Studies making use of this technique are described as follows.

*Occupational mortality.*—This study demonstrated differences in the mortality between various occupational and industrial groups. Information about occupation at the time of death is not very useful for such a study. Persons often leave the occupation that they held throughout their economically active life because of old age or poor health. These occupations, however, may have influenced their state of health. Mortality probably is higher in occupations that are strenuous and injurious to health.

The study, therefore, followed the population that was registered at the census in 1970 whose employment status was recorded. In addition to the population census material, including PN's, the systematized CPR material is computed into the population statistics and provides information about decreases in the population resulting from deaths, migrations, and other causes during 1970-75. Medical statements from death certificates were also used in

this study to calculate the cause-specific mortality rates for the various industrial groups.

*Census population statistics.*—In Denmark, population and housing censuses are traditionally taken every 5th year, and accordingly a population census should have been taken in 1975.

Because of the cost and inconvenience to the population, the census was not taken. Instead planning data corresponding to population census statistics were obtained from existing registers.

The reference date of these statistics is July 1, 1976, and the basic source is the Central Population Register. The population is grouped both by various geographical criteria, for example, parishes, according to the CPR's address register, and by urban areas as defined by the United Nations. Maps from the various municipalities combined with population data from the CPR are used to code urban areas. Through a complicated linking process involving several tax registers and a Central Register of Enterprises and Establishments, information about an individual's occupation and industry can be provided. Finally, the various items of information have been combined to produce information for family nuclei. This combination was accomplished through address data and family references from the CPR.

*Sample surveys.*—As indicated, existing register data can be used in the production of population, social, and health statistics.

This method of production is, of course, far from satisfying all statistical requirements. For example, satisfactory information about factors of employment and their effect on the state of health cannot be compiled solely on the basis of data already registered. A closer analysis of this subject would require the collection of special information from the population, perhaps from special groups of the population. This collection may be done by interviews or mailed questionnaires, and it could, moreover, be necessary to carry out clinical and laboratory tests. The data collection should be based on some form of randomly selected representative samples. The selection of a representative sample would require a complete list of all persons in the population under review, and therefore, the CPR serves as a suitable basis. The population that is the subject of the study can be printed out from the CPR provided it can be defined by means of the data contained in this register.

Danmarks Statistik and Socialforskningsinstituttet (The National Institute of Social Research) currently conduct various sample surveys on the basis of the CPR, such as surveys of Danmarks Statistik's labor force that are accomplished by mailed questionnaires sent to 1½-5 percent of the population. The samples used for these surveys are persons selected by their dates of birth, and the selection is made solely on the basis of the PN's. The questionnaires never ask for background data that can be obtained from the CPR register.

*Health statistics.*—Linkage techniques using the PN are employed increasingly in the health area. The scope for such research is very broad as evidenced by an analysis of the recurrence of legal abortions among Danish women in 1975-77, which was based on the Abortion Register and compiled by the National Health Service. Here, the PN's are used for linking to create a history of each woman. Another survey that is being prepared concerns the use of medicine and drugs. Prescriptions for medicines must always contain the PN of the patient. In this survey, all prescriptions issued on one particular day have been registered on magnetic tape, therefore, the use of medicine can be distributed according to the social circumstances of the patients. The prescription tape then will be linked with personal data on income and occupation, on the basis of tax registers and the Central Register of Enterprises and Establishments.

## FUTURE PLANS REGARDING THE UTILIZATION OF REGISTERS

The future development of population and social statistics will to some degree be determined by the development of the registration systems. Moreover, the requirements of statistical production are also taken into consideration when reorganizations and extensions of the registers are being planned.

During the next few years expansions of the register systems will make it possible to comply

with urgent needs of the users of statistics. Two of these expansions will follow. The chain of registers important for population statistics has recently been extended by a new link: a national basis register of all buildings and dwellings is about to be established. This register will contain information about, among other things, location, size, age, and installations of the dwellings, and the dwellings will be identifiable by means of a specified address code. The address code system constitutes a national and unambiguous system of identification of all buildings and dwellings, and the codes will, in the same way as the PN's, be used in all pertinent registers listing a residence in the CPR as well as listing a business establishment's address in the Central Register of Enterprises and Establishments.

The address code system will make it possible to combine information about dwellings and residents. This combination means that the data about dwellings can be used as background variables in the various population statistics, for example, health statistics. Statistics on dwellings and residents are, moreover, essential to public and private planning, and traditionally such statistical data could only be obtained in connection with the regular population and housing censuses. In the future, analyses can be made more frequently and can be more current.

Denmark is obligated to produce both population and housing census statistics in 1981, and it plans to collect the statistical data from the registers directly without inquiries to the population; however, it may be necessary to supplement the census with questionnaire surveys based on samples regarding data that cannot be retrieved from the registers.

The other planned expansion of the register system is registration of establishments, such as local business units. The existing Registers of Enterprises and Establishments contain information only about enterprises that are legal business units comprising more than one establishment.

The expansion, which is taking place largely for statistical purposes, will make it possible to specify the number of establishments within a certain geographical area. Moreover, it will be possible to combine information about the location of the establishment and the residence of the employee to determine the extent of commuting. Also, the location of employment can be used as a basis variable in population and social statistics. Finally, the possibilities of analyzing the population by industry, will be improved. These improvements are to be realized by a project based on data from the tax authorities' register of employers' notifications of employee's wages, salaries, taxes paid, and other information.

This register contains references partly to the employees by their CPR numbers, and partly to the enterprises by the employer code numbers, but the project requires that individual establishments be identified. At present the project is still in an initial stage but the first statistics compiled will be for 1979. The outcome of this project is essential to fulfilling all the possibilities of the register-based census of 1981.

In conclusion, with the existing registers many possibilities for conducting important statistical surveys have not yet been explored. Some of the surveys discussed can be expected to elicit new statistical projects. For instance, the basic data developed for the study of occupational mortality (employment and death statistics) can also be used for other special studies such as the mortality of selected population groups.

## CHAPTER V

# THE POPULATION REGISTRY AND THE USE OF PERSONAL IDENTITY NUMBERS IN ISRAEL

### INTRODUCTION

The State of Israel was established May 15, 1948. The fledgling Government immediately took steps to conduct a census that, in addition to enumerating the population, was to serve as a voter's register in the elections of January 1949, and was also to be the basis for a new permanent population register. The census was taken on November 8, 1948, under the direction of the Central Statistical Bureau in cooperation with the Ministry of Interior. At the top of each census form a personal identity number of six digits was printed; this number became the PN of the persons registered in the census. Eventually these forms were transferred to local registration offices throughout the country, and they became the "Register of Residents."

A card index for each person was also maintained. Every resident aged 16 and over received an identity certificate; a child under 16 was entered on the parents' identity card. Each card was identified by the same number that appeared on the census form. Immigrants and persons born after the census were added to the Register of Residents and were provided with identity numbers. If a person emigrated or died, his form was removed from the subdistrict office files to a central removals archive. In February 1949 an Act, the Registration Ordinance of Inhabitants of 1949, legalized the census registration forms, and the Population Registry Law of 1965 established the present basic registration procedures.

According to that law, the following items shall be included in the Population Register:

1. Surname, first name, and previous name
2. Name of parents
3. Date and place of birth
4. Sex
5. Ethnic group
6. Religion
7. Personal status (single, married, divorced, or widowed)
8. Name of spouse
9. Names, dates of birth, and sex of children
10. Past and present nationality, nationalities
11. Address
12. Date of entry into Israel
13. Date of becoming a resident

In addition to the previous information from census forms and the Ordinance of 1949, data was compiled on occupation, additional professions, employers, language in daily use, and ability to read and write.

Those responsible for the establishment of the Central Population Register in 1948 probably did not completely understand the implications and potential of the registration system as an administrative tool. It was initially conceived as a device for the identification of individuals, for the enumeration of the population, for the distribution of food, and for the avoidance of fraud in elections. Other registers established by the early Government were originally completely independent. These included Registers of Birth and Death (Ministry of Health); Record of Immigration, Naturalization, and Passports (Ministry of Immigration); and

Records for Food Rationing (Ministry of Commerce and Industry). A resident sometimes had to apply to four or five different agencies to obtain documentation and assistance.

In 1952 the Ministry of Interior transferred information from report forms to keypunch cards. One index used was the PN. In 1966, the content of the cards was transferred to magnetic tape. Under both methods, the Population Register was used more extensively as a tool for public information and administration. In 1952, for example, almost all of the functions of the Ministry of Immigration were combined with those of the Population Register. The resident's visa form became a card in the population register system, with the PN as a link. In 1953, the function of issuing ration books to the population was transferred from the Ministry of Supplies and Rationing to the Population Register Office, Department of Interior. Again the PN was the link. The censuses of 1961 and 1972, which also used the PN, referred to the register to check on the complete enumeration of the population. Various Government agencies presently use the PN as an identifier in their records systems and have a tie-in with the Population Register.

## A NOTE ON THE ISRAELI USE OF A NUMBER SYSTEM

Several countries, mainly in Europe, had reservations about using a personal identity number that reminded them of wars and concentration camps, and, therefore, thought that they should not attach a number to a person but rather use only his name. It is a paradox that the State of Israel introduced a Person-Number system first. It has now been in use for 30 years, and is generally accepted, possibly because the resident's name is primarily used with the PN to assist in identification and integration.

Adopting another number consisting of meaningful digits, such as the birth date that is used in the Scandinavian countries, has been suggested. However, as an immigration State, Israel would experience many errors in the registration of divergent peoples, who register in haste and cannot give their birth dates. Furthermore, the Israeli system is too well established for any fundamental changes to be considered.

## DEVELOPMENT OF THE EXISTING PN

As stated earlier, the first PN was printed on the 1948 census forms, and the first number issued was 000001. To avoid an excess of high numbers, a series prefix in the form of a letter was affixed when the six-digit number would no longer suffice, and a series prefix was used for special populations (e.g., an "a" series block was given to new immigrants who moved directly to immigrant homes from a ship). The new series began with "a 000001" and continued through "g." When the punch-card system was introduced, the letter prefix was translated to a number: "a" became "1." Thus the original six-digit number became a seven-digit PN. Many errors occurred as a result of the duplication of numbers. Because some agencies did not routinely use the prefix, duplication was sometimes appalling. To minimize error at the time of input into the computer, the Ministry of Interior decided in 1977 to add one control digit to the PN using the Modulus 10 system. At the same time an additional digit was added to the PN to enable the numbering system to accommodate future needs above 10 million. Thus the PN today is composed of nine digits, including one check digit.

## USE OF THE PN SYSTEM

Israel has been interested in developing a computer terminal network for the extended integration of statistical systems, but this development has been delayed. Only one terminal exists at the Department of Interior that links their mechanization unit (an input-output unit) with the computer at the Office Mechanization Center for answering various location requests, for correcting errors, and for clarifying input. Current updates from the Central Population Register are provided to the following agencies:

1. The Ministry of the Interior—from the main office to the field offices

2. The police
3. The Ministry of Defense and all branches of the Army
4. The National Insurance Institute
5. The Bank of Israel
6. The Ministry of Foreign Affairs
7. The Ministry of Health
8. The Ministry of Education
9. The Ministry of Absorption
10. The Central Statistics Bureau
11. The Broadcasting Authority
12. The Parliament's Elections Committee
13. All the municipal authorities in the country

Most of the previously mentioned agencies also get constant periodic service and also various ad hoc services.

### Registration of Births

An example of the process by which integration of data between ministries is achieved can be demonstrated in the efforts to standardize the registration of births. The problem was one of timeliness and duplication, and various reporting forms were used for this effort. The Ministry of Health, on the basis of the hospital patient forms for mothers, punched the data of the newborn children in the hospitals. It also prepared immunization cards that were sent to the newborn child's parents. The Ministry of Interior registered newborn children in the population registry, prepared birth certificates, and entered the childrens' names in the parents' identity certificates. The Central Statistics Bureau handled about 100,000 birth forms and, coded, punched, and absorbed the information for its own purposes. The National Insurance Institute received ongoing reports of births, but independently gathered personal data about the newborn children and their parents to pay the childrens' allowance to families beginning with the birth of the first child. The Institute needs this data within a few days of occurrence to begin payments.

In October 1975, a joint task force was created to recommend a common birth form and a coordinated flow process. The original of the prepared form goes to the registration center of the Department of Immigration and Registration, which is now set up for combined coding with the Central Statistics Bureau, and for processing by the Office Mechanization Center. The first copy goes immediately to the National Insurance Institute and is designed to provide the basis for the payment of the children's allowance. The second copy is given to the parents for entry on the identity certificate by an employee at the immigration and registration office (in the parents' presence). The third and last copy remains at the hospital.

This process is to be experimentally tested, and after a trial period the Ministry of the Interior and the National Insurance Institute may share the coding and punching. The Ministry of Health and the Central Statistics Bureau will get a copy of magnetic tapes with data from the Ministry of the Interior. Both the Ministry of Health and the Central Statistics Bureau will then release the birth notification copies and in return will receive the required data in a mechanized form from the Ministry of the Interior. The preparation at the Ministry of the Interior that is necessary for issuing a birth certificate, and the process of entering the information on the parents' identity certificates will remain as they are.

### Voters' Ledger

The voters' register both for the Parliament and for local government is based on the PN and the records of the population registry. If necessary, the Ministry of the Interior can prepare an updated voters' register *2 months prior to Parliamentary elections.* According to law, elections in the State take place every 4 years, but there are cases when, for various reasons, they are held earlier.

### Border Control Card File (Personal)

The border control card file was under the sole charge of the Israeli police, but has now

been transferred to the Department of Immigration and Registry. It has two types of handwritten cards, one concerning the traffic of tourists and the other the traffic of residents.

A mechanical parallelization between this card file and other collections, such as the population registry collection or a collection of individuals insured in the National Insurance, is impossible for obvious reasons. The plans for the mechanization of the border control system were completed recently and their execution has just now begun. The integration between the border control collection and other registers can be developed with the PN as the linking factor. Obviously this integration applies only to the part of the records that concerns residents.

## PROBLEMS AND DIFFICULTIES WITH THE SYSTEM

Israel's peculiar position as an immigration State with a heterogeneous population creates a situation where initial registration can be a source of error. Registration takes place at three main centers: border posts, hospitals, and registration offices. No uniform authority supervises all registration. Border guards, for example, are under the jurisdiction of the police as well as the Department of Immigration and Registration. At times, the bulk of the border registration must be carried out at night under duress. New immigrants are often incapable, because of language difficulties, of answering questions properly, and therefore, inaccurate information can be provided and must be corrected later. Letting immigrants enter without the PN assignment was considered but was vetoed because new immigrants require many vital services immediately and these services are programmed through the numbering system.

A more confusing problem that still exists is in the construction of the PN. The series letter prefix led to the duplication of numbers. Also, when the system of data handling was changed from a manual to a mechanical card index in 1952, the series letter was translated into a digit extending the number from six to seven positions. The phenomenon of duplicate PN's for a time damaged the reputation of the Central Population Register and deterred some agencies from participating in the system. All the duplicate numbers were removed from the computer and half of the owners of these numbers were summoned to the register offices to eliminate the duplication. Some residents refused to cooperate, and others protested, so this problem has not been completely resolved.

The type of control digit used by the Department of Interior was introduced because other ministries had already adopted that system. A better system than the Modulus 10, with different weights, could have been introduced but would have disrupted the existing systems and would have been costly. However, a reliable control exists because the digits input program checks the initials of the person's name as well as the PN.

Another problem has emerged with the addition of the control digit plus an additional digit to provide a number over 10 million. All the registrants (about 3,500,000 are in the Population Register) have to be notified that they have a control digit. Notifications were planned for the time of elections. All other Ministries that have a relation to the system and have used a seven-digit format also must be made aware of this change. Extensive informational activities, arrangement of joint seminars, and periodic checks are planned to cope with this problem.

## PLANS FOR THE FUTURE

Israel plans to attain the following objectives within the next 5 years:

1. Expansion of integration, with all the Government agencies that handle population matters as well as with all public institutions that require data from the system. This expansion will involve maximal development of the data base to include all information in the personal file and any additional data.
2. Addition of the control digit to the PN's on all pertinent documents and the elimination of all other types of numbers

in public administration (such as Army serial numbers).

3. Development of uniform standards for all documents, including both format and content.
4. Establishment of a network of terminals in all immigration and registry bureaus that will be connected to a central computer.
5. Establishment of a central archive.

Israel also expects to mechanize the handling of passports, develop a registry of firearms, and generally improve the quality of data.

## CHAPTER VI

# ADVANTAGES AND LIMITATIONS OF THE PERSON-NUMBER SYSTEM

Although the advantages of using a single referent, a PN number, in statistical computer systems may be readily apparent, and such a system is in practice in business, banking, and Government enterprises, the advantages, as well as the limitations, as they are understood by the countries in this study, should be examined.

### SWEDEN

The PN's are now being used extensively in Sweden as a means of identification in the national registration and taxation systems, in the rest of the public sector, and in the private sector. The use of these numbers is widespread because they have considerable advantages and few technical disadvantages. Their greatest advantages are stability, theoretical safety, ease of use, and ease of memorization. The disadvantages are that they are not entirely self-checking (reversal is possible), and they are carriers of information.

The high stability of PN's over time is inherent in their constituent parts. An individual is assigned a number at birth or, in the case of an immigrant, at his first contact with the population registration authorities, and this number remains unchanged throughout his life. A number can only be altered if it is discovered that errors occurred when it was assigned, for instance, if more than one person was given the same birth number, or if the wrong sex digit was added. Changes in the year, month, or day of an individual's birth are extremely rare except for immigrants from countries with imperfect population registration systems. Nor should there be any change in the three digits of the supplemented birth number. The last digit, the check digit, is only altered if one of the other digits is altered.

The check digit can be constructed according to various systems. A system is chosen by weighing the pros and cons of various factors, such as theoretical safety, ease of use, availability of technical aids and so forth. The Swedish system was designed to facilitate the establishment of the register on the ADP. The system, which was planned in the 1960's, was based on the data registration equipment then available via keypunch cards, when every position was costly. This fact must be considered in any assessment of the checking system when one digit is chosen for the PN.

A PN is easy to remember because people usually remember their own date of birth, and they only have to learn four other figures. Moreover, information is available to aid the memory.

The disadvantage of Sweden's PN system is that it is not entirely self-checking. Because of the advantages this disadvantage is tolerated. The check digit does not single out all the reversals of digits within the number. However, such errors most likely are only minor in extent. Probably these errors only play a minor part when compared with the errors occurring in the practical use of PN's in the various registers, such as manually copying errors. Instead, the essential question is whether or not it is preferable to have an open information-carrying number, as Sweden does now with the date of birth,

or a system that does not disclose any information.

The PN's are firmly integrated in various official registers throughout Sweden; many people think that the use of these numbers has become too prevalent both in private and in official registers. Many, too, dislike the fact that these numbers reveal a person's date of birth. This fact is one disadvantage of an easily run system. A system with a number that does not disclose any information is a much more arduous one to administer—especially the process of assigning the numbers. Furthermore, such a system would not have been possible at the end of the 1940's when the present system was started.

## NORWAY

The main reason for the establishment of the PN system was a need for simplified routines concerning reports on personal matters that were sent to the public administration. The system has solved this problem. The establishment of the PN system created other possibilities. First, it has improved the quality of personal characteristics in two ways: by increasing the value of every characteristic and by shortening the time from the occurrence to the recording of an event. Second, it has provided the potential for the linkage of different public registers. Finally, it has increased the data available for use in statistics, planning, and research.

The establishment of the PN system is in part the establishment of a statistical file system. Such a system is based on the idea that data from different units can be stored in such a way that they can be extracted when needed. This storage is possible with the identification numbers. The role of the register in this system is to assign and maintain the identification numbers. By these identification numbers, information from different sources may be linked together. Furthermore, individuals may be followed over time.

The Central Bureau of Statistics is building up a statistical file system where the files contain all data about persons, establishments, and enterprises having identification numbers. These data are collected through surveys, censuses, and administrative sources. The basis of the system is the CPR and the Central Register of Enterprises and Establishments.

## DENMARK

Experience from the first decade with the CPR numbers confirms that the use of one common and accurate PN within public administration highly facilitates the administrative work, especially in connection with EDP. The administrative registers can communicate by the CPR numbers, and therefore a given personal data item, for example an address, only needs to be recorded at one place in the total register system. This communication also ensures that the best and most updated data can be used by all registers. For the same reason, the distribution of public registration records from several authorities is only a matter of practical organization because the data about the individual technically can be combined with great accuracy, although they are obtained from different registers. However, the highly efficient use of the registers results in a fear of registration; therefore, the problems concerning accessibility of data are accentuated.

Because the PN contains information about the date of birth and sex, it is relatively easy for the individual to remember it rather than a randomly assigned reference number that would have to consist of at least seven digits to include the entire Danish population. By the input of data into the various register systems, the check digit of the CPR number is automatically controlled, and therefore, it is a safeguard against errors both in the writing and the registration of the number.

The use of CPR numbers has had a very great impact on the production of different forms of population statistics. Coordination of the various fields of statistics into one consistent system is now possible. The concept of population statistics can be used as a common framework for references of social statistics, income statistics, health statistics, educational statistics, and so forth. Four data-processing modules

intended for common use in the various population statistics are the following:

1. A module for distribution of the population by residence. (Any geographical division may be applied.)
2. A module for distribution of the population by industry and occupation within a specified period (1 year).
3. A module for assessment of the size of the population at any given time.
4. A module for distribution of the population by family nuclei, such as groups of persons consisting of married couples or single persons with children, if any, staying at the same address.

The possibilities of coordinating population statistics are still far from being fully utilized, but this utilization clearly will result in a much better service to users of the statistics.

As previously mentioned, the use of CPR numbers and administrative registers has meant an improvement in the rationalization of many surveys. Consequently, it has been possible to reduce the processing period and publish statistics that are more current than those previously published. This ability has resulted in a much better service to the users—especially to researchers and planners. To conduct surveys based on questionnaires sent to a representative sample of a population group is efficient because the CPR, on which the samples are based, is frequently updated and contains data of a very high quality; of special importance are the quality of address data in the CPR. These factors reduce the risk of nonresponse which is a source of error in all questionnaire surveys.

The CPR number has made possible certain types of studies that were previously considered impracticable, such as life-cycle analyses where the development of a given population is followed during a rather long period. This study is previously described in the correlation between mortality rates and occupation.

## ISRAEL

Every resident in the State has at the office of immigration and registration in his subdistrict a personal file that contains a registration card with his personal characteristics: surname, first name, parents' names, date and place of birth, nationality, religion, ethnic group, personal status, names of spouse and children, date of entry to Israel, and PN. The personal files are arranged by consecutive PN's. A resident who changes his address from one subdistrict to another can have his file transferred. A resident is bound by law to give notice of any change regarding marriage, divorce, change of address, and so forth. If a resident leaves the country for good or has died, his file is transferred from the living archive to the removals archive. An obvious advantage is that comprehensive centralization makes it possible for a resident to get service at one agency and theoretically within a single day. He can go to one of the immigration and registration offices and accomplish the following: give notice of a change of address, request a change of name, give notice of a change in his personal status, have a newborn child registered, request a birth certificate, get an extract from the register of residents, request a document of Israeli nationality, request and renew a passport (transit certificate), get information about another person's address, check whether he or his family members appear in the voters' register, and request a death certificate for a person who died in the country. The system hinges on an identity certificate with an identity number whose use has become well rooted in public administration. In Israel an identity certificate is a fusion of the simple identification card system and the family book system, which is best known in Western European countries. The identity certificate contains not only information relating to the owner of the certificate, but also contains information concerning the spouse and any children who are still minors, and this information is based on the PN with notations. However, with the advantages of this system certain disadvantages have surfaced:

1. Generally the resident can get service only in the subdistrict of residence where the personal file is located.
2. Considerable migration of files occurs because of change of address from one

subdistrict to another, with all the undesirable implications.

3. The dependence on the personal file for rendering service necessitates maintaining many archives that use a great deal of expensive room, encumber work, and require considerable manpower.
4. The collection of residents is kept sequentially in the computer on magnetic tapes by consecutive PN's and, therefore, it is impossible to carry out updates or to pull out occasional data, and all the material in each run must be viewed.
5. When the computer is inaccessible, many alphabetical and identification lists must be kept for ongoing clarification and location.
6. The inability to trace family relationships is a disadvantage because the existing registration system is an individual, rather than a family, system.
7. When the content of the card file is transferred to the computer and not all of the information kept in the file is entered on the record in the computer, then it is impossible to give service directly from the computer, and this problem increases the dependence on the personal file.
8. Integration with other systems is difficult to achieve.
9. Documentation is often prepared manually and is not efficient.
10. Advanced methods in the area of automatic data processing developed in the last decade have not been adopted.

In 1970 the Ministry of the Interior initiated an extensive survey to propose a more advanced method for maintaining an automatic population registry based on a PN, which would remove the difficulties and adapt the system to modern methods. The following decisions resulted:

1. An effort to expand the record in the computer will be undertaken. This expansion will be achieved by opening every personal file with PN's, comparing its content with the content of the computer record, and correcting and completing the computer record. The record then will contain *all* the current data in the file, and thus the great dependence on the personal file will automatically be discontinued.
2. At the end of this operation all personal files will be transferred to a central archive, because use of the files will be reduced to a minimum.
3. A magnetic data pool (central data base) will be established to replace magnetic tapes with sequential records. The main capacities of the base will be
   a. Constant updating, even relatively small numbers of records in the collection, efficiently and inexpensively
   b. Pullout by various keys through standard service programs and pullout programs that will be specially prepared for different purposes
   c. Change and expansion of the content of the registers without the need for large-scale planning and programming
   d. Connecting with a communication network without the need for large-scale replanning (preparation for an on-line)

The establishment of a data base has the following advantages:

1. The ability to furnish institutions and individuals with one-time or periodic information concerning various groups and sections, in accord with their requests.
2. The ability to issue documentation that presently is given manually and is based on the personal file directly from the computer. Such documents include identity certificates, birth certificates, and passports.

3. The capacity for integration with external systems by the use of terminals.

4. The establishment of a network of terminals from the subdistrict bureaus of the Ministry of the Interior to the Office Mechanization Center or to another center, and the rendering of services directly to the public through these terminals at any office regardless of the permanent place of residence of the applicant.

## CHAPTER VII

# CONFIDENTIALITY AND PRIVACY

The confidentiality of personal information contained in public records systems and the protection of individual privacy are matters of concern in every country. These subjects are discussed at all international statistical and population conferences. The introduction of the computer and the use of a PN as a key to related files created some public concern that these mechanisms may make invasion of privacy easy. Most governments have taken steps to insure confidentiality and privacy in the handling of public records and tapes by establishing legal limitations and procedures. Access to and control over records are strictly limited in most countries. Some western countries that would find it relatively easy to develop PN systems have refused to do so. In one country, the recollection of invasion during war time is a factor; in another, an extensively integrated numbering system was debated in Parliament for more than 5 years because legislators were not satisfied that privacy could be maintained. The idea that stringent control over the population is an aim of such a system is refuted by the fact that the numbering systems are most advanced in the Western democracies. This report provides a description of the situation in these countries.

## SWEDEN

From 1947 to the end of the 1960's the general public in Sweden accepted the use of PN's, deeming them to be a useful and easily manageable instrument by which individuals could be safely identified. However, during the taking of the general Census of Population and Housing in 1970, the question of privacy became eminent. Fears were voiced that the new system, with the rapid spread of ADP records, would lead to an undue infringement of privacy. As an outcome of these discussions, a committee was appointed to study the problem; its report led to the passing of the Data Act and to the establishment of a supervisory authority, the Data Inspection Board, which came fully into operation on July 1, 1974.

The Data Act protects the individual from any "undue infringement of personal integrity" that may ensue from the increasing use of ADP in personal registration. According to the Data Act, no ADP register, file, or other record containing information about an individual may be established or kept without a special permit from the Data Inspection Board. The latter must examine each register from the viewpoint of personal integrity before deciding whether to grant a permit. When doing so, the board may also impose rather far-reaching directives concerning how the register should be kept and managed to obviate any undue invasion of the privacy. If those responsible for a register infringe these directives, then their permit may be withdrawn by the board.

Special rules apply to registers established by governmental or parliamentary decision. The Data Inspection Board has no jurisdiction over such registers; however, it must always monitor the establishment of such registers and, as stated in the preamble of the Data Act, its views must be given serious consideration. The board is also to insure that the directives issued by the Government or by Parliament regarding the management of registers are complied with.

For example, the Cancer-Environment Register is, in principle, available on application to all

scientists and investigators interested in cancer research. The use of the register is, however, regulated by the Data Act with the directives issued by the Data Inspection Board, by the Secrecy Law pertaining to the right of access to public records, and by an agreement between the National Board of Health and Welfare and the National Central Bureau of Statistics. Direct responsibility lies with a special committee for the Cancer-Environment Registry, appointed by the Director General of the National Board of Health and Welfare.

The Data Act is divided into five sections. The first section provides definitions of terms that occur in the text. No mention is made of personal registers as such except for an example of an ADP register containing personal data that can be linked to individuals identifiable either by their name, by a PN, or by some other means. The second section contains provisions concerning permits, directives relating to the purpose and content of the registers, and data that may only be registered in exceptional cases. The third section contains provisions relating to the obligations of those responsible for the registers of individuals. Specifications are stated regarding how and when corrections are to be made in the registers, how a registered person is to be informed, if he requests it, of the facts registered about him, and when data are not to be made available. Another provision states the obligation of those responsible not to disclose information in the registers. The fourth section is devoted to the Data Inspection Board's controlling and supervisory powers. Finally, the fifth section contains rules about any violations of the directives issued by the Data Inspection Board and the consequences of any violation such as penalties, damages, or fines.

A bill proposing the establishment of a CPR in Sweden was submitted to Parliament in 1972. The main purposes of a CPR were to facilitate information storage in records by various sectors of public administration, and to reduce the storage needs to a minimum. Furthermore, the use of PN's would make it easy to retrieve information from the CPR. Consequently, the number of particulars such as name and address could be reduced in other registers. In fact, this procedure has to some extent become a reality because the county administration now supplies data to other computerized registers. However, the bill was not passed; Parliament, with the problem of privacy in mind, deemed it advisable to wait for the passing of a Data Act.

In 1976, Parliament passed a bill setting up a reduced central register of individuals, called the Coordinated Register of Individuals and Addresses (SPAR). Parliament also established what the register was to contain and that its contents were not to be disclosed without the permission of the Data Inspection Board. The SPAR register is updated from information held in the county administrations' notification tape of population registration data. The register must be updated with these particulars once a week. Furthermore, the register is to contain particulars concerning assessed income and the ownership of property. These particulars should be updated once a year. If a person does not want to receive advertising matter directly, the register is to be marked to this effect. The SPAR register is now being constructed and is expected to be in operation in the spring of 1978; it will be developed and operated by the National Data Centre for Administration Data Processing (DAFA).

In the discussions of privacy during the past few years, the use of PN's has been a focal question. Although these numbers facilitate integration between different registers, the existence of such an efficient key to all kinds of information involves great hazards. It would be illogical to eliminate an efficient tool in public administration just because this tool is open to the danger of misuse. The question therefore remains: What precautions must be taken to prevent misuse? Privacy problems must obviously be handled by including adequate safeguards in ADP systems, as established in the Data Act and in the regulations issued by the Data Inspection Board. Technically, PN's can be prevented from acting as keys to registers when special signs are given to prove the legitimacy of an inquiry. Another possibility is releasing only the data required specifically in an inquiry. Consequently, only selected categories of inquiries will be able to obtain information from the registers, and to some of them only limited data

will be made available. Certainly, the use of PN's in Sweden will continue, and the increasingly widespread problems concerning privacy will not prove insurmountable.

## NORWAY

For many years, the Central Bureau of Statistics has been collecting information about persons, and is now establishing a statistical file system that contains several registers. The amount of collected data about persons is steadily increasing. In addition, the local registration offices keep much information about persons stored on magnetic tape in regional computer centers. The increasing amount of data about persons has brought the problems of confidentiality into focus. These problems are no longer only technical problems, but are also political problems.

In 1975, a report was presented by a committee formed to study problems of "privacy" in connection with the establishment and use of public administrative data banks and statistical data archives.[4] Another report concerning personal data in private enterprises was presented in 1974.[5] In June 1978, a Data Act was passed, but has not yet been enforced. Chapter 1 of the law states that the regulations refer to personal registers and use of personal data in central and local governmental services, in private enterprises, in associations, and in other institutions.

According to chapter 2, a Data Inspection Board shall be established as a supervisory authority. The Data Inspection Board shall, among other things, establish and keep a list of all personal registers for which a permit must be obtained. As stated in chapter 4, personal registers using ADP records cannot be established without special permit from the King. In addition, a permit is necessary for other personal registers, when they include data such as race, political or religious views, health conditions, and sexual attitudes.

In chapter 3 general rules are given regarding the rights that persons have concerning information stored about them. Generally, all data shall be available, but there are some exceptions regarding information that can do harm to the person or his family. Exceptions are also stated for registers used only for statistics, research, and general planning.

The Central Bureau of Statistics is concerned about data protection. This question not only refers to the CPR, but also to the entire activity of the Central Bureau of Statistics. Therefore, strict rules for data processing, data storage, and data use have been introduced. Only selected groups of persons can require physical data, and no single person has access to the information. During the year, the Central Bureau of Statistics receives many inquiries for use of personal data. These inquiries are forwarded from private and public institutions, individuals, research workers, and many other sources. The Central Bureau of Statistics collects data pursuant to a special statistical act and an act of population registration. In general, the Central Bureau of Statistics is bound to secrecy about the data. However, personal data given to the CPR according to the latter act, can be delivered to other data users. Pursuant to the act of personal registration, the public authorities (but not all public institutions) have the right to obtain personal data needed in their work. Also, many research institutions, private banks, insurance companies, and so forth, under certain conditions, get birth numbers, names, and addresses from the CPR for their employees, policy holders, and customers.

The local registration offices keep information about persons on written cards. However, the rules for handling the data are strict, and the staff must sign a declaration of secrecy. The registration offices have the authority to approve some standardized use of personal data by the public authorities. The Central Bureau of Statistics has given detailed specifications for implementation, and has established a list of local, regional and central authorities that are allowed to receive such data. The Central Bureau of Statistics has the responsibility to inspect the registration offices, and routinely does so to make sure that all comply with the regulations.

The Central Bureau of Statistics has made an agreement with the regional computer centers

about storing, use, and destruction of personal data. This agreement includes the conditions that were established to allow the regional computer centers to handle the data. These conditions comprise the rules that the computer centers must follow to protect data and prevent abuse. The computer centers register all use of personal data. The agreement makes it possible to inspect the centers and all their personal data routines. The staff at the regional computer centers also must sign a declaration of secrecy.

## DENMARK

During the period since the introduction in 1968 of the PN's, the public debate concerning registration of personal information and safeguard of privacy has gradually become intensified. Occasionally, the problem is presented as if it were a matter of being for or against PN's. This attitude, of course, is misleading, because the problems concerning the protection of personal data predate establishment of the CRP. The introduction of the PN, however, has made the operation of registers more efficient, and the accuracy of personal identification has made it easier to combine information so that many items of information about an individual can be integrated.

As indicated, only public authorities are entitled to demand knowledge of the PN. According to Danish Law the public authorities must not give any personal information to individuals or business establishments. However, a person can, within certain limits, insist on knowing what information is registered about him and has free access to the local population registers for information about the addresses of individuals that the inquirer can identify. The registers are not permitted to pass on individualized information on a large scale to private persons. The staff within the public administration and in the EDP centers, dealing with information for the public, are subject to the general rules of nondisclosure.

If the public authorities use information on the register in a way that is considered by the population as a violation of the right of integrity, this use may result in an opposition against supplying necessary information to them, including the PN. In the case of widespread opposition, the existence of the population registers could be threatened. However, only a few, if any, examples of abuse in connection with the use of registers are known.

In the last few years a certain reluctance against registration has been observed, although the manifestation has perhaps not been so pronounced as in other countries.

In 1978, the Danish Parliament enacted two bills on registers—one concerns Government and municipal registers. The Public Registers Act, which became effective January 1, 1979, clearly stresses the rules of nondisclosure that were already in effect as well as the rules of accessibility of register data. Moreover, it provides the establishment of a Register Board, that shall supervise the registers and approve regulations concerning their operation with a special emphasis on safety measures for the protection of information. The board has the power to exercise control by direct inspection of the installations where the registers are kept. The board must be notified in each case of matching of registers and the board may establish the conditions of how such matchings shall be executed.

Although the primary aim of the Act is to regulate the use of registers in public administration, the regulation also applies to registers that are used only for statistical and scientific purposes. However, the rules applying to such registers are different. Thus the linking of information from different registers can be administered without notification to the board when the purpose is strictly statistical, and the right of a person to know what the registers hold on him is not extended to statistical registers. The reason is that statistics cannot threaten privacy, because information about individuals cannot be identified from the statistical tables, and because individual information on statistical registers must not be used for administrative purposes.

The problem of protection of personal information has long been recognized as important to the production of statistics. The population's confidence that information given for statistical purposes is not disclosed to public authorities or to individuals is vital to the activities of Danmarks Statistik. Consequently, information must

be treated as confidential and must be safeguarded so that no information that may be related to individuals is published.

The practice of Danmarks Statistik has been most restrictive, implying that no identifiable information may be transmitted—even to institutions solely concerned with research work. With the new Act, this practice has become part of Danish Law. The Act makes a concession for research and statistical productions that is not previously made by Danmarks Statistik. With the board's consent in each case, data from statistical registers may be transferred to another public agency that will use the data for research purposes only.

The debate on the question of integrity in connection with the PN has only in one case had consequences that were detrimental to the production of statistics on social benefits. Under The Social Assistance Act (Bistandsloven), Danmarks Statistik must collect data identified by the social clients' PN's from the municipalities. A few local governments have refused to give the PN's because of their clients' right to anonymity. This refusal is not acceptable to the government as it conflicts with the Act of Danmarks Statistik. The dispute has not yet been concluded. The problem may be solved by the previously mentioned Register Act.

## ISRAEL

The Ministry of Interior is acutely aware of the current opinions as well as fears concerning the danger of violating the individual's privacy by "overintegration" when important concentrated information is located at one center and might be available to unauthorized persons who will use it in a harmful way. Therefore the Ministry established these conceptual and practical limits:

1. The data base must not contain information beyond personal logistical data specified in the Population Registry Law.
2. An employee of the Ministry is forbidden to ask questions beyond the 14 questions in the law and is absolutely forbidden to record anything in the file beyond a person's answers to the legitimate questions.
3. No particulars in addition to those mentioned will be noted in the data base, consequently no possibility exists for passing it to any external element. The data base must therefore not contain information such as hospitalization, mention of a criminal past, or data about the resident's income. *This information is essential to other agencies and should only be filed in those agencies.* The data base *will update only the entries in the other agencies.*

What is the common practice for giving information from the resident's collection? Section 29(b) of the Population Registry Law states: "Any person may receive information concerning the name and address of any other person registered in the registry." This Section then states that, without examining the purpose and without permission from the person registered, another party may be given information that appears either in the voters' register, which is open to all, or in any telephone directory. However, section 29(c) of the law also states: "A person who is prima facie interested may also receive information concerning the date of birth and particulars of other registrations determined by the regulations of a person registered in the registry." Recently additional particulars that may be disclosed were determined by regulations that were approved by the parliamentary committee of the Constitution, Legislation, and the Judicial Committee, and they are: parents' names, place of birth, personal status, sex, ethnic group, date of entry to Israel, and PN. Information about religion and nationality was not included and must therefore not be disclosed.

A serious restriction in this section states that information can be given only "to one who is prima facie interested." The Attorney General has clarified these words indirectly by deciding that the information should not be given if it is needed "for ideological, political, or commercial purposes." This statement implies that every legitimate purpose is permitted. Therefore, information can be given to Government agencies and public institutions such as local Government

institutions, the National Insurance Institute, research institutions, and universities to aid them in the execution of their duties provided that they need the information, state why it is needed, and sign a declaration affirming that they will not pass the information on to others. In summary, information is not given if the information is requested for a political purpose, for a business purpose, or for a purpose that opposes the public interest (e.g., solicitation not to enlist in the Army).

In addition to the preceding instructions, a very strong mechanical security system at the Office Mechanization Center prevents any attempt to obtain information from the data base. Pullout and access are permitted only by a code (key) that is constantly replaced and is only known to a restricted number of employees. Even the Minister of the Interior does not know the code.

In brief, the rules are:

1. The population register is "sterile" and it may contain only those particulars of registration that are specified in the Population Registry Law.
2. Information may be channeled to other systems, either governmental or public, only after those who request it have demonstrated that it is required for the proper execution of their functions and for a legitimate purpose. This approach is very useful because it releases the public agencies from the necessity of updating the logistic registration particulars, therefore, they can devote themselves more efficiently and economically to their assigned tasks. For example, the Ministry of Health, which is interested in a followup of people who contracted cancer, will get reports about the facts of their death without the population registry employees knowing why the information is needed and what use is made of it.
3. The authorization for giving information can be given by the Minister of Interior or the Director of the Mechanization Department only. Information cannot be obtained without an explicit authorization by one of these two.
4. The extent of information concentrated, the process of channeling information, and the particulars that may be disclosed are determined in the law and its regulations.
5. Technically, an almost hermetic security system guards against extracting information from the computer.

## CHAPTER VIII

# OTHER PERSON-NUMBER SYSTEMS IN THE WORLD TODAY

Several types of national data systems use PN's as identifiers. Some countries have systems similar to those in the Scandinavian countries although they may not have the same extensive applications. Developing countries, despite the lack of advanced subsystems (e.g., vital statistics systems), skilled manpower, adequate financing, and other resources have adapted the PN system to meet their needs. Some PN systems apply only to a particular agency or operation (e.g., vital and health statistics, national insurance, social security, and pension fund), and others are still in the planning stage. Examples of some of these systems follow. See table C for items in Person Numbers in national data systems.

## ADVANCED SYSTEMS

### Finland

PN's have been used in Finland since 1964; in 1970 the structure was confirmed by law. The program, the Personal Identification Code (PIC), is administered by the Population Register Center. This system is used primarily by the administrative and statistical agencies of the Government and in a limited way in the private sector. The PIC is particularly useful for the construction of population registers and for record linkage of various types.

The PN is a 10-digit figure: 6 birth digits, 3 serial digits, and 1 check digit. The PN has been the identifier in the population census, household surveys, examination registers, university student registers, manpower surveys, as well as in judicial, criminal, election, and vital statistics. The PN is the identifier in the Central Population Register, registers of the tax authorities, and registers of the National Pension Institute. The data collected by the Central Statistical Office are used only for statistical purposes; strict rules of confidentiality are guaranteed by the law.

### France

Numbering systems for individuals as well as for industrial and commercial organizations have been in existence in the French Republic for many years. In 1941 the Demographic Service, the forerunner of the Institut Nacional de la Statistique et des Etudes Economique (INSEE), introduced a 13-digit number that included codes for sex, month and year of birth, and geographic codes for place of birth. This system has formed the basis for an individual identification index that is kept current by reports from civil registration offices. In 1970, the records were placed on computer tape; two check digits were added for computer adaptation. Local administrators send notifications of birth and death as well as changes in civil status to INSEE, and consulates advise INSEE of the deaths of French citizens abroad. The new system became operational January 1, 1973, and is extensively used by the Social Security Administration, the Election Registration, the Ministry of National Education, and the Ministry of Economy and Finance.

The computerized system has permitted the development of new research studies. One study on occupational mortality is based on population samples from the censuses of 1954 and

Table C. Items in Person Numbers in planned or operational national data systems

| Country | Total | Date of birth | | | Serial number | Check digit | Sex | Place of birth | Random number |
|---|---|---|---|---|---|---|---|---|---|
| | | Day | Month | Year | | | | | |
| **General population systems** | Number of digits | | | | | | | | |
| Europe: | | | | | | | | | |
| Denmark | 10 | 2 | 2 | 2 | 3 | 1 | ([1]) | - | ... |
| Finland | 10 | 2 | 2 | 2 | 3 | 1 | - | - | ... |
| France | 15 | - | 2 | 2 | 3 | 2 | 1 | 5 | ... |
| Federal Republic of Germany | [2]12 | 2 | 2 | 2 | 2 | 1 | ([1]) | - | ... |
| Iceland | 9 | 2 | 2 | 2 | 2 | 1 | - | - | ... |
| Netherlands | [3]10 | - | - | - | - | 2 | - | - | 8 |
| Norway | 11 | 2 | 2 | 2 | 3 | 2 | ([4]) | - | ... |
| Portugal | 11 | 2 | 2 | 2 | [5]4 | 1 | - | - | ... |
| Sweden | 10 | 2 | 2 | 2 | 3 | 1 | ([4]) | - | ... |
| South America: | | | | | | | | | |
| Argentina | 8 | - | - | [6](2) | 8 | - | [6](1) | - | ... |
| Chile | 13 | - | - | 2 | 5 | 2 | - | [7]2(2) | ... |
| Colombia | 11 | 2 | 2 | 2 | 3 | 1 | 1 | - | ... |
| Peru | [8]13 | - | - | 2 | 5 | 1 | ([4]) | 4 | ... |
| Uruguay | [3]8 | - | - | - | - | 1 | - | - | 7 |
| Asia: | | | | | | | | | |
| Israel | [3]9 | - | - | - | - | 1 | - | - | 8 |
| Jordan | 13 | - | - | 3 | 5 | - | 1 | [9]2(2) | ... |
| **National health systems** | | | | | | | | | |
| United Kingdom | [10]8 | - | - | 2 | 3 | - | - | 3 | ... |
| Australia | 10 | 2 | 2 | 2 | 3 | 1 | - | - | ... |
| **Other** | | | | | | | | | |
| United States | [11]11 | - | - | 2 | 6 | - | - | 3 | ... |

[1]Sex indicated in control or check digit.
[2]This special Person Number, for insurance purposes, contains 2 digits for a regional number, and 1 digit for the initial letter of the given name.
[3]Random number used.
[4]Sex indicated in serial number.
[5]Serial number includes code for nationals and foreigners.
[6]For check purposes, 2 digits may be added for year of birth and 1 digit for sex (1—male, 2—female).
[7]Contains codes for province of birth and legal office.
[8]One additional digit (3) indicates Peru; 4 digits represent location of registration (department, province, or registration office).
[9]Two digits represent parents' place of birth.
[10]Five letters and 3 numbers (LMNOP 123) include codes for subdistrict of birth, year of birth registration, and quarter of registration.
[11]The U.S. birth number, used by State vital statistics registration offices, has 3 digits for country and State of birth, 2 digits for year of birth, and 6 digits for State file number. A birth in North Carolina in 1980 could have the following birth number:

132-80-000428

The first digit represents the United States (1). The next two digits represent the State of North Carolina (32), in a system that begins with Alabama (01) and continues through Alaska (50) and Hawaii (51). The District of Columbia is 08. There are additional codes for Puerto Rico and the Virgin Islands.

1975. Another study directed by the National Institute for Health and Medical Research, the Institut National de Santé et Recherché Médical, follows tuberculosis and cancer patients' records until death. A special file of persons born on October 1, 2, and 4 (approximately 1 percent of the population drawn from the census of 1968 and followed up with the census of 1975) forms a special sampling frame for socioeconomic studies. Changes in occupation, marriages, births of children, deaths, and other events are integrated through linkage by means of the PN.

The PN is also used for compiling statistics of annual wages by wage records sent from employers to the Social Security Administration and linked through the PN. This compilation is done for a sample of wage earners that includes all persons born in October in the even years.

The advantages of the system, according to the reports, lie in the easy access to files, the availability for statistical or accounting tabulations, the certainty of identification of documents, and the cost-effectiveness.

### Iceland

A population register, The National Registry, is directed by the Statistical Bureau of the Republic of Iceland. This register, which became operative in 1953, is based on a PN provided at birth. This number originally consisted of eight digits, but in 1964 it became a nine-digit number when a Modulus 11 check digit was added, with six digits for the date of birth, two serial digits, and one check digit.

The PN has been principally used as the identification code number in the internal operation of the register. It has not been used extensively for administrative or other purposes. In 1966, a registry of all school children was established (a general continuous pupils register).

Another numbering system is also in use, based on the Nafnnummer or Name Number, related to the name of a person. Introduced in 1959, it is given to every individual who reaches age 12. The Nafnnummer, seven digits plus a check digit, indicates the person's place in the alphabetical sequence of the population by name. A seven-digit Nafnnummer is sufficient because the population is approximately 220,000. Internally, the Nafnnummer is used for linking persons in the same family.

### The Netherlands

In the Netherlands a system of continuous accounting for population statistics was introduced in 1850 and used the census of 1849 as a starting point. The system is decentralized: each municipality keeps its own population register under the Netherlands Inspectorate of Population Registers. Before 1940, the family was the registration unit but that year, the individual became the registration unit and the population register in all municipalities contains a person's register consisting of standard Personal Cards (PC). The PC's are issued at birth and immigration, and follow the person while in the country, throughout his lifetime. All changes in civil status are recorded on the PC and the card of a head of a family is used for a survey of the nuclear family. After death, the PC is removed from the register and placed in a central file kept by the Central Bureau of Geneology. Because the municipal files refer only to the resident population, special procedures exist for the removal of emigrants and the addition of immigrants. The efficient operation of the system has provided the Netherlands with timely annual data compiled by the Central Bureau of Statistics, such as total population; population by age and sex; and population by sex, year of birth, and marital status.

Because the municipalities vary in data-handling methods (some have computers, and others use punchcards or metal plates in addition to hand-administered files), efforts have been made to standardize and improve technical processing. In 1979, a standard municipal computerized system was operating in more than 200 municipalities. A Central Population Register is planned. A bill will be presented to Parliament at the end of 1979 and will provide for, among other things, a PN. Various types of personal numbers had been discussed, but for explicit technical and political reasons, including the matter of confidentiality, random numbers have been recommended.

Actually, such numbers have been in use since 1968 by those municipalities that computerized their population registers. They were furnished by the central Government for computer use only, and consist of eight digits and two check digits. In 1979, the number appeared on the PC's of more than 8 million persons, but it was used only within the municipal administration, and was not known by any individual. The new legislation will enable the Netherlands to produce population and social statistics more efficiently.

At present, statistics on national social insurance, sickness benefit funds, and hospitals do

not use the municipal numbers in their records. If a central system is introduced, the use of the number may be extended to these records.

## DEVELOPING COUNTRIES

Developing countries, in coping with the increasing problems of data management, have considered establishing national data systems for program planning and Government administration. Many countries have shown a special interest in the PN systems of the Scandinavian countries, and have sent administrators and statisticians to study them.

In Latin America, legislation establishing national PN systems has been passed in some countries, but the concept has not had broad application, nor has it led to any extensive integration of data from subsystems. The PN is frequently used as a means of identification in addition to an identity card, photograph, and fingerprint. It is also used as a file number on various administrative records, such as social security and civil registration records.

### Argentina

A population numbering system has been in operation in Argentina for a number of years. Under this system each person on reaching 18 years of age was registered and issued a seven- or eight-digit number. Males were given a Libreta de Enrolamiento and females were given a Libreta Civica that contained their registration number. In 1968, the registration age was lowered to 16 years of age and the documents were unified in a Certificado Nacional de Identidad. In 1970, the name of the identification document was changed to Documento Nacional de Identidad (DNI).

Although this activity focused on the continued registration of adult persons, a corresponding program in 1968 began the registration of all persons at birth. Every newborn child is issued a PN of eight digits. At 8 years of age each person's DNI is updated with a photograph and fingerprints. At 16 years of age, the individual's signature is recorded and information such as marital status, occupation, education, languages, involvement in the practical arts and sports is added. This information is updated periodically throughout the lifetime of the individual. Also, beginning in 1968, all persons born before that year, on reaching 16 years of age, are issued a PN and DNI. By 1984 this procedure will be completed and in that year the entire population will be included in the unified PN system.

Foreigners may also be given PN's when they become residents; a minimum of 1 year of permanent residence is required. If they become Argentinian citizens, then the standard PN and DNI are issued.

Under the law, the purpose of the system is to provide information on the country's human resources for defense and development: also anticipated is the eventual development of a continuous population register.

### Chile

Although recognizing the necessity that reliable information must flow to Government agencies for development and planning, Chile was also concerned about the duplication of administrative information systems. A national integrated population information system involving two factors was planned: (a) the assignment of a unique number under the Rol Unico Nácional (RUN) to each person and (b) the creation of computer files or population data banks known as the Régistro Nácional de Poblácion (RNP). The information system would standardize identifiers in all institutions such as social security and pension institutions, the tax authority, and the electoral register. Records from the Civil Registration and the Identification Service would be incorporated, and the files would be continually updated by information on birth and death as well as reports of changes in civil status.

Most of the adult population had already been issued an identity number in the tax system under the Rol Unico Tributario (RUT), which consisted of seven digits and one check digit. The RUT number is still used for identification in tax offices and in Government agencies. Since 1975, a new identity number, a PN of 11 digits and 2 control digits, is issued at birth and follows a person throughout his life. Those born prior to 1975 will continue to use the old number. The new number consists of two digits

for province of registration, legal office, and year of registration; and a five-digit serial number, plus two check digits. The basic file will contain the PN (RUN), name, date of birth, sex, identity number, and possibly nationality and residence. The new number is to be used as the standard identifier for all records related to health, education, and welfare, and as a research tool in socioeconomic studies.

Between 1976 and 1978, the massive project of assigning numbers to the unnumbered population was undertaken. In 1979, an administrative reorganization of the Civil Register and Identification Service was initiated. The possible revision of the numbering system is one of the topics for consideration. Furthermore, a plan to create a new central file using the RUN number, which will integrate data from all separate files related to the Social Security System, was ready for implemention in 1979. It will go into effect with the reorganization of the civil registry service.

### Colombia

In the Republic of Colombia, the National Registration Service (SNI) of the National Administrative Department of Statistics (DANE) was established in 1968. The SNI instituted a new Civil Registry System in 1971, and the key to this system was a unique number issued at birth. The SNI considered using a unique identifier for an individual and his socioeconomic characteristics. This identifier could help solve some registration problems and also could eliminate duplication among various civil administrations. The number consists of 11 digits: 6 digits to indicate year, month, and day of birth; 1 digit to indicate sex (1-female, 2-male); 3 digits to indicate a serial number, plus 1 check digit.

The number was first assigned only to babies born in Bogota; then it was assigned to births in other large cities as well as other areas. The present file contains 5 million registrations of the 25 million citizens of the country. The registration number covers documents related to birth, death, marriage, identification, and driver's licenses. Various other procedures are presently under study. Officials from other Latin American countries, notably Ecuador and Costa Rica, have recently visited Colombia to study the system for possible adoption in their countries.

No plans to link records exist. The numbering system is used to check files and correct them, to prevent duplication of the records, and to calculate vital statistics estimates. Hopefully, in time, all civil records will bear the PN.

### Peru

To obtain demographic data to plan projects, allocate resources, and evaluate programs, the Government of Peru in 1975 established the National Statistical System (INE) designed to gather, tabulate, and analyze statistical data. Furthermore, INE was given the responsibility for developing and improving the civil registration/vital statistics system. For technical support INE requested the collaboration of the Office of International Statistics at the U.S. National Center for Health Statistics through its Vital Statistics Improvement Project (VISTIM). A Model Vital Statistics System was implemented in demonstration areas throughout the country. Among the new techniques used was the event identification number (EIN) assigned to all birth certificates. With the development of a PN, INE plans to add a check digit.

The EIN is uniquely constructed. The first digit (3) represents Peru as defined by an international convention on vital statistics numbering cosigned by Canada, Peru, and the United States. The next four digits represent a location code identifying a registration office (including a department, province, and official or registration institution). The next two digits represent year of registration. The serial number of five digits that represents the birth number follows. With the check digit the PN will consist of 13 digits. Presently, the total number of digits appears flexible, and depends on the actual number of digits used to indicate the place of registration and serial number of births. Because the system is still evolving a final appraisal cannot be made. The major objective is to introduce successful aspects of the model system into the National Vital Statistics System.

### Uruguay

In 1974, Uruguay established a PN system based on a complicated coded combination of

seven digits and four letters. The first six digits constituted the birth date, and the seventh digit was a code indicating sex and citizenship. The four letters were the first initials of the first and family names. Two check digits make the total 13. Obvious problems with this complex identifier existed, and in 1978 Uruguay simplified the system by developing a random PN number of seven digits plus one check digit. This number is issued to all persons over age 12. Provisions are made for the registration of aliens and emigrants and for all persons entering the legal registration age. Each registered person is issued an identity card containing the PN, name, residence, civil status, date and place of birth, a photograph, and fingerprint. The cards are subject to renewal at ages 20 and 60.

The system is administered by the National Directorate of Civil Identification under consultation with the Honorary Technical Advisory Commission. The number is now largely used for personal identification and recordkeeping in public and private institutions such as hospitals and schools, and will be extended to national administration. Registration at death is recorded by the PN, and registration at birth is recorded by the parents' PN's. When the system is fully operational, the record linkage potential will be explored to develop an alternative to the census of population. While developing the PN system, Uruguay also established a Register of Enterprises and Entrepreneurs identified by unique and permanently assigned numbers.

### Jordan

Perhaps the most recent application of a PN in a national system is in the Hashemite Kingdom of Jordan.

The Department of Civil Status registers Jordanians in a special "Civil Register," which is a family register based on the head of the family. The detailed registration form provides information about all family members, including education, occupation, and marital status. In addition, each head of the family receives a 36-page Family Book where every member has a page to record personal details and changes. When a family member reaches age 16, he is provided an identity card that facilitates travel in Jordan and the Arab common market countries.

Under the new system, a PN is issued at birth and remains with the individual throughout his life. This number appears in the family register, in the Family Book, on the I. D. card, and on all official documents. The 13-digit number is constructed as follows:

2 digits – place of birth

2 digits – parents' place of birth

3 digits – year of birth

1 digit – sex (1–male, 2–female)

5 digits – serial number

As an example, the number 12219552 45894, would identify a woman born in 1955 at Amman, whose parents were born at Naour. Presumably, she was the 45,894th child born in Amman in that year. The PN has been used for administration and identification and, therefore, has improved civil registration. The development of a more complex numbering system is not contemplated now.

## HEALTH, SOCIAL SECURITY, AND INSURANCE SYSTEMS

National health records systems using a PN as an identifier exist only in a few countries and are highly restricted. Considerations of privacy and confidentiality limit access to hospital and physicians records even for statistical research. Two systems of special interest are the fully operational system of the United Kingdom and the proposed system of Australia.

### United Kingdom

The initial use of a PN in the United Kingdom coincided with the wartime establishment of the National Register in September 1939. After a census enumeration of the population, identity cards were issued to all recorded persons by the Central National Registration Office. To record births, a unique code of four letters and a serial number (1-500 in each subdistrict), was developed. The system of national registration ended in 1952, but prior to that, the National Health Service (NHS) needed an identifying number for each patient and the obvious

choice was the National Registration code. In 1965, a new code was established, which consisted of five letters and a birth register entry number. Three letters indicated the subdistrict of birth; the fourth letter, the year of registration (M=1979); and the fifth letter, the quarter of registration. The last is useful because births are collated and indexed on a quarterly basis.

The birth number serves only as a file number in the NHS and it has no statistical use because it is a key to any form of general purpose population register. Considerations of confidentiality impose restrictions on use outside the NHS system.

### Australia

The Australian experience differs from that in other countries because discussion of a numbering system began with a plan to develop medical record linkage throughout the country. A working group of the Computer Committee of the Hospital and Allied Services Advisory Council, selected in 1971, established criteria for the identification key to medical records, studied identification systems in various countries, made a computer analysis of existing files, and arrived at a combined Letter-Number indicator. This indicator consisted of the first four characters of the surname, the first two characters of the first forename, the second initial, sex, date of birth, and a check digit. Plans to establish a National Population Index for identifying populations at risk, which would be located at a National Index Centre, were recommended but were not implemented.

Changes in Government in 1972 and 1975 and in the health insurance programs altered the plans regarding medical record linkage. Health insurance prior to September 1976 had been administered by a single Government commission; after that, private insurers provided this insurance. This change required some form of unique identifier, and a health insurance number of 10 digits was chosen. This number consisted of six digits for date of birth and sex, three digits for a serial number, and one for a check digit. However, continuing controversy has delayed implementation.

### Other countries

Other limited national numbering systems exist, mostly in the insurance and social security systems where a personal account number applies only to (or primarily to) the records of that system.

*Czechoslovakia.*—An Insurance Number is used, which refers to the beneficiaries file in the pension administration and consists of nine digits, six for birth date and three for the serial number.

*Switzerland.*—An Insurance Number is also used for systems such as registration, tax, and sickness funds. The number has 11 digits: 3 for the surname, 2 for the year of birth, 1 for quarter of the year of birth, 2 for day of birth, 2 for serial number, and 1 check digit.

*Austria.*—A Social Account Number of 10 digits is implemented: 3 are for the serial number, 4 for birth day and month, 2 for decade, and 1 check digit.

*United States.*—A Social Security Account code of nine digits is employed (three for area number, two for group number, and four for serial number). In some countries, the codes for social security and other accounts could be made into national population PN's, but the extension of the existing numbers might be difficult. In the United States, for example, an estimated 4 million duplicate account numbers exist.

## OTHER NATIONAL SYSTEMS

The PN system has been discussed extensively in all regions of the world. Japan tested several types of PN's in urban areas but did not apply them nationally. In the Federal Republic of Germany, an extensive system was proposed but was not approved by Parliament. Inquiries regarding the PN systems and their applications to health services have been received by the National Center for Health Statistics from such diverse areas as Thailand and Brazil. In the United States, discussion of a national numbering system has been ongoing for almost 40 years.

### Federal Republic of Germany

In 1971, the Federal Ministry of the Interior had submitted to Parliament a draft of a Federal

Registration Law that provided for the introduction of a uniform personal identification number. Parliament refused to introduce a PN for registration and administration.

A special personal number, an "insurance number," has been issued to members of the statutory old-age insurance group as well as to employees entitled to obligatory health and/or unemployment insurance (wage earners, salaried employees, and persons undergoing occupational training) who are not subject to obligatory old-age insurance.

This special 12-digit PN is composed of a regional number for the old-age insurance funds (2 digits), the date of birth (6 digits), initial letter of the birth name (1 digit), the serial number and distinction by sex (2 digits), and the check digit (1 digit). This PN is used only for maintaining accounts of the insured, handling queries within the scope of statutory social insurance, and compiling statistics on employed persons.

Protection regarding privacy and confidentiality is established by law because the secrecy provisions of the Social Code permit the disclosure of microdata to third parties when either the individual agrees to or when legal obligation demands disclosure. Other agencies of social administration receive microdata subject to the secrecy provisions within the scope of administrative assistance, that is, when data are necessary for the completion of their tasks. A linking of statutory old-age insurance data with other registers or files has not been provided for, particularly because other institutions (e.g., health insurance) have numbering systems of their own for their members and the linking of data is doubtful under the data protection law.

### Japan

In 1971 and 1972, Japan tested various types of PN's in five different cities. One PN was a 10-digit code, including 1 check digit. Another was a 14-digit number with the first 6 numbers representing the birth date, the next 4 representing the area of residence, the next 3 representing a serial number, and the last one a check digit. The PN activity never advanced past the testing stage.

### Portugal

The numbering system of Portugal is administered by the Bureau of National Registration of the Ministry of Justice. Since 1957, a permanently assigned number has been issued sequentially and placed on identification cards. The identification card is not mandatory for the population; however, it is required for attending high school, obtaining a driver's or a marriage license, and declaring taxes. It has been customary to obtain a card after age 12. The identification number is used for many administrative purposes such as tax control, health care and insurance, and social security.

The National Register was established by law in 1973. The objective was to create two central files, the Central File of Population and the Central File of Organizations. The population file was to be based on a new national number provided after birth, which would consist of 11 digits; 6 for date of birth, 4 for the file number (the first included a code for Portuguese nationals and foreigners, and the last distinguished men from women), and 1 check digit. The implementation of the population file was suspended after the revolution of April 1974. The new Constitution of the Portuguese Republic of April 1976 is very explicit in the use of Person Numbers: "Citizens shall not be given all-purpose national identification numbers" (Article 35). The Government is preparing drafts for a law on privacy. The Constitution is to be revised in 1980, and apparently the Central File of Population will be discussed. In the meantime, the file on civil identification and the number on the identification cards are being kept in force.

The Central File of Organizations includes enterprises, associations, agencies, official bodies, and self-employed individuals. A nine-digit number (type of organization, serial number, and check digit) is the key to this file.

### United States

The concept for the PN system originated during World War II when State and local vital statistics offices were deluged with requests for certifications of birth, for proof of citizenship

and age. In 1941 at the urging of the Association of State and Territorial Health Officers (ASTHO), a Vital Records Commission was appointed to investigate the system and suggest improvements. The Commission suggested a fixed identification number for each person in a national registration. In 1947, the Council of Vital Records and Vital Statistics suggested that each State adjust its birth certificate number to conform to a uniform numbering plan for the entire country. A uniform number in three segments—three digits for country and State of birth, two digits for year of birth, and six digits for State file number—was suggested. This suggestion was cleared with the ASTHO and was subsequently ratified by 35 out of 54 registrars.

For various reasons, the concept dropped out of sight until the midsixties. In 1966, the Study Group on Record Linkage of the U.S. Public Health Conference on Records and Statistics recommended that the birth number, as suggested in 1948, be placed on all State certificates by January 1, 1968. The U.S. National Committee on Vital and Health Statistics also endorsed State use of the number. Although the "universal" number now appears on State birth certificates, the Federal government does not use it. Inquiries concerning it have been made by the Social Security Administration. States use the number for filing and for exchanges of certificates between States. For the U.S. birth number, or any other PN, to become truly operational, a Federal law establishing it throughout the country has to be passed by the Congress.

# REFERENCES


[1]Central Bureau of Statistics: *Divorces 1971-1973.* Statistiske Analyser No. 16. Oslo. Central Bureau of Statistics, 1975.

[2]Central Bureau of Statistics: *Occupational Mortality 1970-1973.* Statistiske Analyser No. 21. Oslo. Central Bureau of Statistics, 1976.

[3]Central Bureau of Statistics: *Occupational Mortality.* RAPP 79/19. Oslo. Central Bureau of Statistics, 1979.

[4]Ministry of Justice: *Offentlige persondatasystemer og personvern* (Public personal data systems and protection of [personal] privacy.) NOU 1975:10. Oslo. Ministry of Justice, 1975.

[5]Ministry of Justice: *Persondata og personvern* (Personal data and protection of privacy.) NOU 1974:22. Oslo. Ministry of Justice, 1974.

[6]U.S. Department of Commerce, Bureau of the Census: *World Population 1977: Recent Demographic Estimates for the Countries and the Regions of the World.* Washington. U.S. Government Printing Office, 1978.

[7]United Nations: *Demographic Yearbook 1977.* New York. United Nations, 1978.

# BIBLIOGRAPHY


Aurbakken, E., and Bjerve, P. J.: The role of registers and the linking of data from different sources. *Bulletin of the International Statistical Institute*, Vol. XLV, Book 3, 1973. pp. 169-184.

Bacci, R., Baron, R., and Nathan, G.: Methods of record linkage and applications in Israel. *Bulletin of the International Statistical Institute*, Vol. XLII, Book 2, 1967. pp. 766-785.

Bakketeig, L. S., and Hoffman, H. J.: Perinatal mortality by birth order within cohorts based on sibship size. *Brit. Med. J.* 2:693-696, 1979.

Bakketeig, L. S., Hoffman, H. J., and Sternthal, P. M.: Obstetric service and perinatal mortality in Norway. *Acta Obstet. Gynecol. Scand.*, Suppl. 77, 1978.

Bakketeig, L. S., Seigel, D. G., and Sternthal, P. M.: A fetal-infant life table based on single births in Norway, 1967-1973. *Am. J. Epidemiol.*, 107(3):216-255, 1978.

Bolander, A. M.: Linkage of census and death records to obtain mortality registers for epidemiological studies in Sweden. *Excerpta Medica: Proceedings of the 11th International Cancer Congress.* Florence, Italy, 1974.

Central Bureau of Statistics: *The Use of the Netherlands System of Continuous Population Accounting for Population Statistics*, by J. C. van den Brekel. Voorburg (The Hague). Department for Population Statistics, 1976.

Dalenius, T.: The invasion of privacy problem and statistics production—an overview. *Stat. Tidsskr.* No. 3: 213-225, 1974.

Departamento Administrativo Nacional de Estadistica. (DANE). *Manuel de instrucciones para effectuar el registro de nacimiento.* Bogota. Direccion General de Procesamiento de Datos, Servicio Nacional de Inscription, Registro de Personas, 1973.

Departamento Administrativo Nacional de Estadistica (DANE). *Ventajas del nuevo sistema de registro civil.* Bogota. Servicio Nacional de Inscription, 1973.

Department of Commerce: *Computers, Health Records, and Citizen Rights.* National Bureau of Standards Monograph 157. Washington. U.S. Government Printing Office, 1976.

Department of Health, Education, and Welfare: *Records, Computers, and the Rights of Citizens.* DHEW Pub. No. (OS) 73-94. Washington. U.S. Government Printing Office, July 1973.

Desabie, J.: Organismes: L'INSEE entreprend d'automatiser le repertoire des personnes. *Econ. Stat.*, No. 10:69-71, Mar. 1970.

Dunn, H. L.: Record linkage. *Am. J. Pub. Health* 36:1412-1416, Dec. 1946.

Dunn, H. L.: A national identity registration system to synthesize social statistics. *Estad.: J. Interam. Stat. Inst.* XI(40):605-615, Sept. 1953.

Federal Security Agency: *Historical Review of the Birth Number Concept.* National Office of Vital Statistics, Public Health Service, Washington, D.C., 1948.

Hansen, M. H.: The role and feasibility of a national data bank, based on matched records and alternatives. Report of the President's Commission, Washington, D.C.: *Fed. Stat.* II(1-61): 1971.

Hoffman, H. J., Bakketeig, L. S., and Stark, C. R.: Twins and perinatal mortality: a comparison between single and twin births in Minnesota and Norway 1967-1973, in *Twin Research: Biology and Epidemiology.* New York. Allan R. Liss, Inc., 1978. pp. 133-192.

Institut National de la Statistique et des Etudes Economiques (INSEE): *Automatisation du repertoire d'identification des personnes physiques.* Paris. INSEE, Conception Generale, Feb. 1970.

Institut National de la Statistique et des Etudes Economiques (INSEE): *Le numero national d'identite description.* No. 160/429. Paris. INSEE, Jan. 19, 1971.

Karlsen, K., and Skaug, H.: *Registers in the Central Bureau of Statistics.* Pub. No. 22. Oslo. Statistiske Sentralbyra, 1968.

Lunde, A. S.: The birth number concept and record linkage. *Am. J. Pub. Health* 65(11):1165-1169, Nov. 1975.

Lunde, A. S.: National data systems and record linkage. *International Statistical Institute: Contributed Papers* (Warsaw), Sept. 1975. pp. 536-541.

Lunde, A. S.: Problems in the Establishment of National Data Systems. Proceedings of the Social Statistics Section (135th Annual Meeting, Atlanta), American Statistical Association, 1975. pp. 544-547.

Ministry of Interior: *Population Register of Israel.* Jerusalem. Ministry of Interior, 1972.

Nathan, G., and Baron, R.: The Israeli Population Register as a Framework for Sample Surveys. International Symposium on Automation of Population Register Systems, Jerusalem, Sept. 25-28, 1967.

National Institute of Statistics: *INE-VISTIM Vital Statistics Improvement Final Project Plan.* (translation from Spanish). Lima. National Institute of Statistics, 1978.

Nordbotten, S.: Purposes, problems, and ideas related to statistical file systems. *Bulletin of the Interna-*

*tional Statistical Institute*, Vol. XLII, Book 2, 1967. pp. 734-750.

Ohlsson, I.: Merging of data for statistical use. *Bulletin of the International Statistical Institute*, Vol. XLII, Book 2, 1967. pp. 750-764.

Selmer, E. S.: Registration numbers in Norway: some applied number theory and psychology. *J. Roy. Stat. Soc.* (Series A), 130, pt. 2, 225-231, 1967.

Statistiches Bundesamt, Federal Republic of Germany: *Betrifft: Personen Kennzeichen*. Bonn. Statistiches Bundesamt, 1972.

Statistisk Sentralbyra: The Central Registers of the Central Bureau of Statistics of Norway. Working Papers of the Central Bureau of Statistics, Oslo, 1974.

Statistisk Sentralbyra: *Fetal and Infant Mortality 1969-1972*. Statistical Analyses No. 15. Oslo. Statistisk Sentralbyra, 1975.

Tryggveson, R.: Population Registration and Its Use for Statistical Purposes. International Symposium on Automation of Population Register Systems, Jerusalem, Sept. 25-28, 1967.

United Nations: Methods of Collecting, Organizing, and Retrieving Social Statistics to Achieve Integration: Report of the Secretary General. (E/CN.3/516). New York. United Nations Economic and Social Council, 1978.

Widen, L: Registret over femtondefodda. *Stat. Tidsskr.*, No. 5:366-372, 1969.

# APPENDIXES

## CONTENTS


I. Construction of the PN in Sweden ..... 52

II. Construction of the PN in Norway ..... 53

III. Structure of the PN in Denmark ..... 54

IV. Construction of the PN in Israel ..... 55

V. Items in the Swedish Cancer-Environment Register ..... 56

VI. Items in Study "Outcome of Successive Pregnancies for Norwegian Women 1967-1976" ..... 57

VII. Population, Birth, and Death Data ..... 59


### APPENDIX FIGURE


I. Construction of Person Number for a male born on June 3, 1936: Denmark ..... 54


### APPENDIX TABLE


I. Total population and number of births and deaths with rates of Sweden, Norway, Denmark, Israel, and the United States of America ..... 59

## APPENDIX I

# CONSTRUCTION OF THE PN IN SWEDEN

The PN's were adopted in 1947 when the regional registers were set up at county administration levels. Originally, these numbers consisted of nine digits which included the date of birth (six digits) and a birth number (three digits). Date of birth is indicated by two digits for the year, two for the month, and two for the day. For example, the date of birth of a person born April 25, 1938, is written 380425. The use of this reverse order—year, month, and day—was farsighted at the time; recently the International Standards Organization declared that numerical dates should always be expressed in that order. The birth number consists of three digits ranging from 001 to 999. Odd numbers stand for males and even ones for females.

When the existing county registers, which were printed from metal plates, were replaced in 1967 by magnetic tape registers, a check digit had to be added to the date of birth and the birth number. This check digit was arrived at by using Modulus 10 algorithms. Therefore, a PN now contains 10 digits. The date of birth and the birth number/check digit are separated by a hyphen (e.g., 380425-6653). The year a person reaches 100 years of age the plus sign supersedes the hyphen.

In the ADP system, the Modulus 10 algorithm is used for the calculation of the check digit, and the weights 2 and 1 are used. This enables an identity number to be checked automatically when data are registered. The method of calculation is illustrated as follows:

| | | |
|---|---|---|
| Identity number | 450410 | 149 |
| Weights | X 212121 | 212 |
| Products | 850420 | 2418 |

Sum of products 8+5+0+4+2+4+1+8 = 34
(N.B.: 18 is read as 1+8.)

The last digit of the sum is subtracted from 10 (i.e., 10−4=6), and the answer becomes the check digit. The complete identity number becomes 450410-1496.

The identity number is checked when recorded.

| | | |
|---|---|---|
| Identity number | 4504101496 | |
| Weights | X 2121212121 | |
| Products | 85042024186 | |

Sum of products 8+5+0+4+2+0+2+4+1+8+6=40

If the last digit of the sum of the product is not 0, then an error must obviously have occurred; this is indicated by the output.

——— ooo ———

## APPENDIX II

# CONSTRUCTION OF THE PN IN NORWAY

The birth number system includes both the identification number and the routines to assign and maintain the identification numbers. The Norwegian identification number is based on the date of birth and the sex of each person. The number consists of 11 digits and is constructed as follows:

| *Date of Birth* | | | *Individual* | *Check* |
|---|---|---|---|---|
| *Day* | *Month* | *Year* | *digits* | *digits* |
| 26 | 05 | 97 | 651 | 81 |

The last individual digit indicates sex. If the person is a woman, the number is even. If the person is a man, the number is odd.

Persons born in the 19th century are assigned numbers within the 749-500 range, and those born in the 20th century are assigned numbers in the 499-000 range. Numbers are assigned consecutively in descending order.

The last two digits are check digits. The first digit is calculated by weighting the date of birth and the individual digits with standard weights.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Birth number | | 2 | 6 | 0 | 5 | 9 | 7 | 6 | 5 | 1 |
| Weights | X | 3 | 7 | 6 | 1 | 8 | 9 | 4 | 5 | 2 |
| Products | | 6 | 42 | 0 | 5 | 72 | 63 | 24 | 25 | 2 |

Sum of products 6+42+0+5+72+63+24+25+2 = 239

The sum is divided by 11 (i.e., 239 ÷ 11 = 21 with a remainder of 8 where $r_1$ = the remainder) The first check digit is $K_1 = 11 - r$ (3 in preceding sample).

If $r_1 = 0$, the $k_1 = 0$. If $r_1 = 1$, then the number is rejected and the next individual digit in the range is assigned.

The second digit is calculated in the same way; however, IBM standard weights are used:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Birth number | | 2 | 6 | 0 | 5 | 9 | 7 | 6 | 5 | 1 | 3 |
| Weights | X | 5 | 4 | 3 | 2 | 7 | 6 | 5 | 4 | 3 | 2 |
| Products | | 10 | 24 | 0 | 10 | 63 | 42 | 30 | 20 | 3 | 6 |

Sum of products 10+24+0+10+63+42+30+20+3+6 = 208

The sum is divided by 11 (i.e., 208 ÷ 11 = 18 with a remainder of 10). The second check digit is $k_2 = 11 - r_2 = 1$. The complete PN becomes 26 05 97 651 31. The five last digits of the birth number, that is, the individual digits and the check digits, are called the personal number.

Every PN is calculated by a special automatic EDP routine. This routine checks which numbers are in use and which are not. A birth number that once has been used will never be used again.

The Central Bureau of Statistics has the responsibility of assigning birth numbers twice a month. Lists comprising the assigned birth numbers are then sent to the various local registration offices.

———— ooo ————

## APPENDIX III

# STRUCTURE OF THE PN IN DENMARK

The Person Number is purely numerical and consists of 10 digits.

Figure I shows how the number is constructed.

The check digit is computed by means of the Modulus 11 algorithm on the basis of the other nine digits which are weighted by a set of constants as follows:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Identity | | 0 | 3 | 0 | 6 | 3 | 6 | 1 | 1 | 7 |
| Constants | X | 4 | 3 | 2 | 7 | 6 | 5 | 4 | 3 | 2 |
| Products | | 0 | 9 | 0 | 42 | 18 | 30 | 4 | 3 | 14 |

Sum of products 0+9+0+42+18+30+4+3+14 = 120

The sum is divided by 11 (i.e., 120 ÷ 11 = 10 with a remainder of 10). The check digit is found by subtracting the remainder from 11 (i.e., 11 - 10 = 1).

By employing this method certain combinations of the first 9 digits give a check digit of 10; these combinations cannot be used. If the result of the calculation is a check digit of 11 (i.e., 11 - a remainder of 0), the check digit is given the value of 0.

When the check digit is odd, as in this case, the number is assigned to a man. When it is even, it is assigned to a woman.

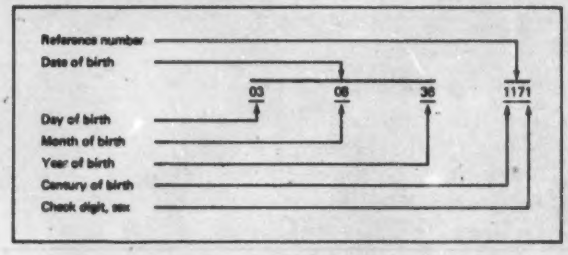


Figure I. Construction of Person Number for a male born June 3, 1936: Denmark

## APPENDIX IV

# CONSTRUCTION OF THE PN IN ISRAEL

The original PN of Israel, developed in connection with the census of 1948, consisted of six digits as in the number 114888. Later, a series prefix was added using letters "a" through "g"; with a "d" prefix the number would become d/114888. These letters were often assigned to designated groups; for example, an "a" series block was given to immigrants arriving by ship, and series "e" was provided to maternity hospitals. The introduction of a mechanical card index system in 1952 required that the letter prefix be changed to a number; "a" became 1 and so on, with the result that the PN became a seven-digit number (in our example, "d" became 4, and the number was 4114888). In 1966 the content of the mechanized residents card index was transferred to magnetic tape and, subsequently two changes were introduced. First, the base number was extended by one digit to accommodate the needs of a future population of 10,000,000 or more; this created an eight-digit PN (04114888). Second, a check digit was introduced, calculated on the Modulus-10 algorithm, which provided a nine-digit PN. The method of calculation is as follows:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Identity number | | 0 | 4 | 1 | 1 | 4 | 8 | 8 | 8 |
| Weights | X | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Products | | 0 | 8 | 1 | 2 | 4 | 16 | 8 | 16 |

Sum of digits 0+8+1+2+4+1+6+8+1+6 = 37

When the last digit of the sum is subtracted from 10, the answer (3) becomes the check digit and the complete PN reads 041148883.

———— ooo ————

## APPENDIX V

# ITEMS IN THE SWEDISH CANCER-ENVIRONMENT REGISTER

The Swedish Cancer-Environment Register is administered by Planning Division 3, Statistics: National Board of Health and Welfare, S-106 30, Stockholm, Sweden. Data were integrated from the Cancer Register and the 1960 Census of Population and Housing.

Data from the Cancer Register (persons registered in 1961-73) include:

- Person Number (PN)
- Tumor serial number
- Sex
- Name
- Occupation
- Civil status
- Domicile
- Date of diagnosis
- Date of death
- Hospital, department
- Record-card number and year of record entry
- Pathologist/cytologist
- Specimen number and year specimen taken
- Site of tumor
- PAD (Pathological diagnosis after death)
- Diagnostic criterion
- Metastasis
- Treatment
- Died from cancer
- Diagnosis incidentally at autopsy
- Benign
- Causes of death
- Date of death
- Age at diagnosis
- Age at death
- Survival time

Data from the 1960 Census of Population and Housing include:

- Domicile
- Type of activity
- Occupational status
- Occupation
- Economic activity
- Gainful employment
- Location of place of work
- Main occupation during the year
- Country of birth
- Higher education
- Person Number (PN)

———— ooo ————

## APPENDIX VI

# ITEMS IN STUDY "OUTCOME OF SUCCESSIVE PREGNANCIES FOR NORWEGIAN WOMEN 1967-1976"

This groundbreaking research is being conducted by Dr. Leiv S. Bakketeig, Institute of Community Medicine, University of Trondheim, Norway. It is receiving support from the National Institute of Child Health and Human Development, National Institutes of Health, U.S. Public Health Service.

Variables are integrated from three sources: the Norwegian Medical Birth Registry (maintained at the University of Oslo), the Norwegian Death Files (Central Bureau of Statistics), and the Census File.

Data from the Medical Birth Registry include:

A. Variables relating to the mother:

1. Maternal age—by year, date of birth
2. Maternal parity—number of previous births and among these number of stillbirths
3. Maternal marital status—unmarried, married, divorced, separated, widowed
4. Time of marriage—by calendar year
5. Place of residence—by municipality (444 in the country), characterized by county, urban, rural, industrialization
6. Duration of pregnancy—days based on date of birth minus date of LMP
7. Mother's health before pregnancy—maximum 3 conditions, 3-digit ICD code
8. Mother's health during pregnancy—maximum 3 conditions, 3-digit ICD code

B. Variable relating to the father:

1. Paternal age—by year, date of birth

C. Variables relating to the family:

1. Family relations between parents—1st cousins, 2d cousins, etc.
2. Family history of disease—serious, inheritable disease among relatives—maximum 3 conditions, 3-digit ICD code, 4th digit indicating relationship of the newborn baby to the family member suffering from the disease

D. Variables relating to the confinement:

1. Place of birth—by municipality and by institution, classified by level of obstetric service
2. Time of birth—day, hour, and minute
3. Induction of labor—special code/classification 1-9
4. Fetal presentation—special code/classification 1-9
5. Complications during labor—special code, maximum 4 classifications
6. Intervention during labor—special code

7. Intervention performed—by physician, by midwife
8. Information on amniotic fluid, placenta, umbilical cord—special code

E. Variables relating to the birth:

1. Sex
2. Plurality
3. Status—fetal death/stillbirth, died before onset of labor, during labor or within unknown time of death; livebirths dying during first 24 hours, 1-6 days, 7-27 days, 28 days to 1 year, end year, 3d year or later; livebirths still alive
4. Birth weight—nearest 10 grams
5. Length
6. Asphyxia—special code
7. Congential malformations, birth injuries, and diseases—maximum 3 conditions, 4-digit ICD codes

Data from the Norwegian Death Files (Central Bureau of Statistics) include:

1. Place of residence at time of death—municipality
2. Place of death—special code
3. Sex
4. Date of birth
5. Date of death
6. Type of death—accident or disease
7. Causes of death—maximum 4 diagnoses, 4-digit ICD code
8. For dead children less than 2 years of age—marital status of mother

Data from the Census File include:

A. Information on the mothers:

1. Type of income/support
2. General education—Norwegian standard classification
3. Highest education—occupational education, academic degree, and so forth
4. Occupational activity—housewife, student, employee, and so forth
5. Industry—standard International Industry classification (ISIC)

B. Information on the fathers:

Same as above, except for "housewife" classification

———— ooo ————

## APPENDIX VII

# POPULATION, BIRTH, AND DEATH DATA

Table I. Total population and number of births and deaths with rates of Sweden, Norway, Denmark, Israel, and the United States of America

[Midyear population estimates for 1977; births and deaths with rates for 1976]

| Country | Total population[1] | Number of births[2] | Birth rates[2] | Number of deaths[2] | Death rates[2] |
|---|---|---|---|---|---|
| Sweden | 8,255,000 | 98,345 | 12.0 | 90,677 | 11.0 |
| Norway | 4,044,000 | 53,474 | 13.3 | 40,216 | 10.0 |
| Denmark | 5,089,000 | 65,267 | 12.9 | 54,001 | 10.6 |
| Israel | 3,611,000 | 97,469 | 27.6 | 23,856 | 6.8 |
| United States | 216,817,000 | 3,165,000 | 14.7 | 1,912,000 | 8.9 |

SOURCES: [1]U.S. Department of Commerce, Bureau of the Census: *World Population 1977: Recent Demographic Estimates for the Countries and Regions of the World.* Washington. U.S. Government Printing Office, 1978 (reference 6).

[2]United Nations: *Demographic Yearbook 1977.* New York. United Nations, 1978 (reference 7).

———— ooo ————



*U.S. GOVERNMENT PRINTING OFFICE: 1980 311-240/20 1-3